DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

SCIENCE SERVICE

DIVISION OF BOTANY AND PLANT PATHOLOGY

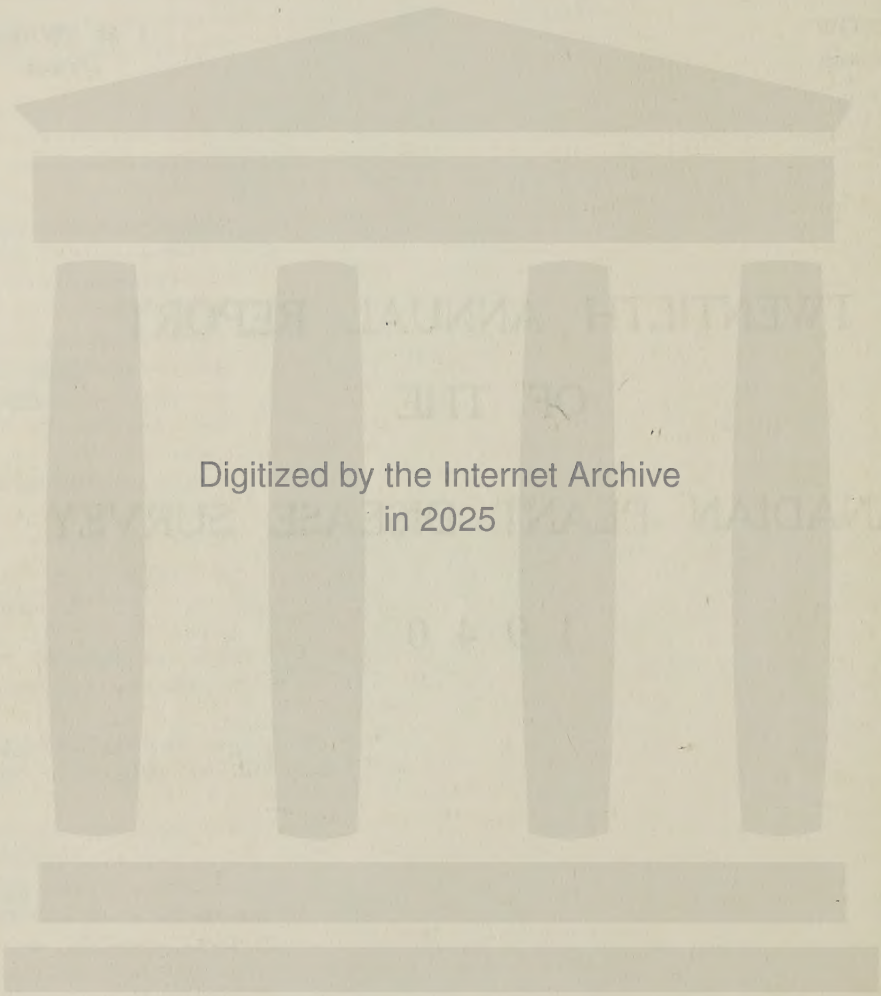
H. T. GÜSSOW
Dominion Botanist

J. M. SWAINE
Director

TWENTIETH ANNUAL REPORT OF THE CANADIAN PLANT DISEASE SURVEY

1 9 4 0

Compiled by:
I. L. CONNERS
Associate Plant Pathologist



Digitized by the Internet Archive
in 2025

https://archive.org/details/canadian-plant-disease-survey_1940_20

FOREWORD

The present report is the Twentieth Annual Report to be issued and the twelfth compiled by the present writer.

An important change has been made in the arrangement of the diseases under each crop. Diseases due to specific fungi, bacteria or nematodes are placed first, arranged alphabetically according to the genus and species of the pathogen. Diseases due to viruses or suspected of being of virus origin form a second group. Diseases or disorders due to any other cause such as frost, hail, etc., lack of essential elements as well as diseases of which the cause is unknown, undetermined, or where the reporter would not hazard a guess, are placed in a third group. In the second and third groups the diseases are arranged alphabetically under the name assigned to them.

Another innovation has been to include a French translation of the section on "New and Noteworthy Diseases" in special appreciation of French readers. Dr. Rene Lachance, Dominion Laboratory of Plant Pathology, Ste. Anne de la Pocatiere, Que., has kindly undertaken the translation.

At this point, I wish also to thank all who have contributed material for the reports. Most of them are mentioned by name after one or more of their contributions in the main body of the report. I also wish to thank Dr. G. Maheux, Chief, Plant Protection Service, Quebec Department of Agriculture, for the permission to use material from a report on cereal diseases in Quebec in 1940 prepared by I. H. Crowell and D. Leblond.

Two special sections are also included, one on "Virus diseases of potatoes, 1940", by Mr. D. J. MacLeod and a second entitled "Additions to the fungus flora of the Mackenzie River Basin" by Dr. Margaret Newton. These sections will undoubtedly be of interest to certain workers.

As in previous reports in recent years potato diseases are reported in some detail thanks to the District Potato Inspectors. This is true this year except for British Columbia, from which province no special report was received.

My thanks are also due to Dr. E. S. Archibald, Director, Experimental Farms Service, for his courtesy in having the Reports mimeographed at the Multigraph Room and to Miss Hill and her staff for the excellent quality of the actual work.

I. L. Conners,
Associate Plant Pathologist.

May 29, 1941
Central Experimental Farm
Ottawa, Canada.

New or Noteworthy Diseases

Stem rust of wheat did little damage in Western Canada owing to the use of resistant varieties in those areas where stem rust has been a serious factor. Farmers' fields of susceptible wheat are rarely found in southern Manitoba and are uncommon in eastern Saskatchewan. However, in a few areas further west, especially in south-central Saskatchewan, rust damage was severe on late crops of susceptible varieties. In eastern Canada, stem rust was unusually light. Evidence was obtained that the rust-resistant varieties yielded about as well as the older varieties under these rust-free conditions.

Both stem rust and crown rust of oats were usually present only in small amounts from Manitoba eastward. Nevertheless, in New Brunswick, where field observations were extensive, outbreaks of crown rust were traced directly to buckthorn plantings and further evidence was obtained on the importance of barberries in perpetuating stem rust on oats.

The effect of common root rot (Helminthosporium sativum and Fusarium spp.) on the yield of wheat was studied again in Manitoba. The average loss was estimated to be 16.6% compared to 7.4% in 1939. The number of tillers per plant and the yield of grain were both reduced in proportion to the injury. Due to better growing conditions in 1940, however, more plants per row reached maturity and the yield per unit area was greater. In Alberta and Saskatchewan, the disease appeared to be about as prevalent as usual, but the infection was less severe.

Kernel smudge was more prevalent than usual in the Prairie Provinces, particularly in common wheat. A survey revealed 7.6% of the cars degraded in Manitoba, 2.4% in Saskatchewan and 2 cars in 5,000 in Alberta. Alternaria spp. predominated. Varietal differences were also noted.

Speckled leaf blotch was unusually prevalent on wheat in Alberta. Septoria Tritici was present almost to the exclusion of S. nodorum.

Among the diseases of forage crops, bacterial wilt (Phytomonas insidiosa) of alfalfa is increasing in importance. It was widespread in the irrigated districts in southern Alberta. The disease was particularly heavy in the Brooks area, where stands under 3 years of age were affected. It was also severe in all fields of Grimm at the Experimental Station, Summerland, B.C. Phytophthora root rot (P. Cactorum) was generally distributed on sweet clover in southern Alberta. New extensions or records of forage crop diseases were: balck stem (Ascochyta imperfecta) of alfalfa in Quebec; Stagonospora leaf spot (Leptosphaeria pratensis) on alfalfa in Alberta; the perfect stage of the same pathogen on sweet clover in Alberta; leaf spot (Stemphylium botryosum) on alfalfa at Agassiz, B.C.

Stalk and ear rots were very destructive in the seed corn belt of southwestern Ontario; the rots were due to Nigrospora sphaerica, Fusarium moniliforme, F. graminearum and Diplodia Zeae.

Leaf spots of sugar beet new to Canada were found at Sidney, B.C.; one was caused by Ramularia beticola, the other by Septoria Betae. Buckwheat was contaminated by Ustilago utriculosa from affected smartweed growing in the crop. The presence of this smut on wheat and oats has already been noted (P.D.S. 12: 4-5, and 17: 9). Smut (Ustilago Crameri) a rare smut in Canada, was recorded on seed of foxtail millet from Carnduff, Sask. The first authentic case of halo blight (Phytomonas coronafaciens var. purpurea) on brome grass and timothy was found at Morris, Man.

Bacterial ring rot (Phytomonas sepedonica) was found on 89 farms in the important potato growing district of southern Alberta, compared with 40 farms in 1939, but conditions were favourable for its detection. The use of diseased seed was considered to be an important factor in its further spread. There was an increase of bacterial ring rot in Manitoba, Ontario and Prince Edward Island, while a decrease occurred in Quebec and New Brunswick. Since most of these cases were on farms where bacterial ring rot was not found before, it is believed that a greater part of the disease is being eliminated as it is detected.

Late blight (Phytophthora infestans) was epidemic in Ontario in 1940, destroying at least 20% of the late potato crop. Losses were comparable to those suffered in 1928 and 1934. Late blight caused some loss elsewhere in Eastern Canada, but only in New Brunswick was damage considerable.

Wilt, particularly Verticillium wilt, has attracted attention in several provinces. Its importance has been further emphasized since in its milder forms a vascular necrosis occurs in the tubers, which has not been recognized as associated with the presence of these pathogens. On the other hand, much of the phloem necrosis is due to infection with leaf roll.

Additional information on the virus diseases present in potatoes is contained in a separate section contributed by Mr. D. J. MacLeod.

Tomato diseases of interest were: Ring spot, a sub-infection by Botrytis cinerea, was present on tomato fruits in Ontario. A new strain of Cladosporium fulvum appeared to which Vetomold, a new variety immune to strains 1-4, was susceptible. However, Red Currant, a variety of L. pimpinellifolium is resistant to the new strain and varieties of tomatoes possessing this resistance are about ready for introduction into commercial production. Serious losses were sustained from decay of tomato fruits by species of Phytophthora in Ontario.

Other vegetable diseases which might be mentioned are: Violet root rot (Rhizoctonia Crocorum) on carrots at Comox, B.C.; late blight (Septoria Apii-graveolentis) on celery in the Okanagan Valley, B.C.; purple blotch (Macrosporium Porri) on onion in Nova Scotia; Mycosphaerella allicina, as a cause of leaf blight in onion in Ontario; Septoria flagellifera as a leaf spot of peas at Douglas, Ont.; and big vein (virus) of lettuce at Burlington, Ont.

Crown rot has long been a serious disease of apples in the Okanagan Valley, B.C. Recent work indicates that much of it is due to Phytophthora cactorum. While powdery mildew (Podosphaera leucotricha) has been found on apple across Canada, it is particularly severe in the Okanagan Valley, and spraying must be resorted to to prevent russetting of the fruit. On the other hand, spraying for apple scab (Venturia inaequalis) must be practised almost everywhere in Canada. In 1940, scab was fairly heavy on unsprayed trees, but where the trees are well sprayed the disease was effectively controlled. Brown rot (Sclerotinia americana) was unusually destructive in cherries, peaches and plums in the Niagara Peninsula on account of the wet weather in the early season.

Virus diseases continue to attract attention in tree fruits. Mosaic of apple appears to be definitely spreading in Nova Scotia and New Brunswick. False sting, a disease observed first in Nova Scotia in 1934, has recently been shown to be due to a virus. Several new diseases of cherry and plum have been described in the past two years in the Okanagan Valley; some of these have been proved to be virus in character.

Rhizosphaera Kalkhoffii was abundant on the needles of blue spruce sent from Knowlton, Que.; it may be destructive. Willow blight was found in a few trees at Abbotsford, B.C. Physalospora Miyabeana, particularly the Gloeosporium stage was fruiting freely on the twig cankers. Fusicladium saliciperdum was also present on a leaf petiole in the spring collection, but later it was entirely absent. The diseased trees are being removed. Search elsewhere failed to disclose other centres.

New records of diseases of ornamentals were grey bulb rot (Sclerotium Tuliparum) on bulbous iris in B.C. and bacterial leaf spot (Phytomonas Primulae) on Primula polyantha also in B.C.

The Weather and Its Influence on Plant Disease

In the Coastal area of British Columbia during 1940, the weather was characterized by a very mild winter, a wet and mild early spring and a dry June. Due to the low precipitation in June, the yield of field crops was in general below average.

Leaf mould of tomatoes appeared earlier than usual in greenhouses and caused considerable damage. The disease was probably favoured by the higher than average temperature in late winter and early spring.

The mild winter and higher precipitation in early spring was favourable for the early spread of leaf spots of grasses, tulip fire, narcissus smoulder and downy mildew of hops. The dry weather in June checked most of these diseases, particularly downy mildew of hop and yellow rust of raspberries.

Late blight was general on potatoes in the Lower Mainland, but damage was mostly confined to tubers dug late; rainfall was slightly above average in October.

In Alberta, the winter of 1939-40 was exceptionally mild and there was relatively little mortality in the over-wintering stands of legumes, grasses, and winter wheat. Seeding was greatly delayed by a wet, late spring, but subsequent growth was rapid under the generally favourable conditions which prevailed during June and July. Browning root rot of cereals was much less prevalent than in 1939 and did not cause any appreciable damage. Certain foliage diseases, however, developed rapidly under the moist conditions in July and were unusually common.

Crop maturity was hastened by hot, dry weather during August. In some districts this resulted in premature ripening and shrivelling of the grain. Under these conditions stem and leaf rust of wheat spread slowly, despite unusually heavy primary infections, and there was very little rust damage. Take-all of wheat caused the least damage observed in several years, but common root rot of cereals was not noticeably reduced. Very little frost damage occurred, in spite of the late season. Harvesting of the heavy crop was delayed by wet weather in September and considerable threshing was not yet done when the snow came in late October.

Seeding started at Saskatoon on April 22, 1940, which was about a week earlier than in 1939.

While the supply of moisture varied widely in different parts of the province, there was probably sufficient for germination in most districts. Certain districts had no reserve moisture in stubble land due to the heavy crop of 1939 and lack of rain and snow after its harvest, and some soil drifting occurred early in May. Seeding was delayed in south central, southwestern, and the southern part of west central Saskatchewan due to wetness of the land. The weather during the normal seeding period

in southern Sask. was cold and backward. With the exception of the areas mentioned above, most districts were suffering from lack of moisture by the fourth week in May and some uneven germination and retarded growth were evident. Rainfall up to this time was unevenly distributed and the weather varied from cool to warm. Drought conditions in east central, northern, and the northern part of south central Sask., forced the crops prematurely during June and they headed early and were light. The weather was generally cool during June and some frost occurred, causing some damage in low areas. Crops in many areas, notably south east, Regina-Weyburn and central, suffered a serious decline during the first three weeks in July. This was due to hot weather and lack of rain. Up to this time the crop was generally free of disease except for small areas where rust-susceptible varieties of wheat were grown. In these areas in south central and south western Sask. where rainfall was abundant, stem rust became severe on the susceptible varieties and light on others and some damage was caused. Leaf rust of wheat and leaf spots of wheat, oats and barley also were prevalent in the wetter areas, notably northeastern Sask. Common rootrot was slight during the cool weather in June but increased in severity in July especially in the dry areas. On the whole it was less severe than in 1939. Severe browning rootrot was found in N.E. Sask. where moisture conditions were good. In general the areas of severe infection were small and scattered and on the whole the disease was less severe than in 1939. This may be due to the almost complete absence of hot dry winds and the occurrence of cool and moderately good growing weather in June. The weather during the first two weeks in August varied from extremely hot to moderately warm and precipitation was light. Some early reports of damage to threshed grain by cracking were received; this is popularly associated with dry hot weather during ripening. Later, occasional rainfalls, together with warm weather caused some sprouting of unthreshed wheat and also of threshed wheat stored in piles in the fields.

Observations on weather conditions in Manitoba will be found under stem rust of wheat.

The weather in the Niagara Peninsula was particularly favourable for the development of fungus diseases. Rainfall was not only above the average in May and June, but periods of precipitation were more numerous and the monthly mean relative humidity was higher. The hours of bright sunshine were very few in May and generally the temperature remained cool. Spells of continued wet, cool weather would last for 4-6 days. One such spell occurred during the blooming period of peaches and cherries and resulted in an exceptional amount of blossom blight. It also favoured a heavy primary scab infection of apples and unusual instances of spray injury from materials ordinarily employed with safety. Another more or less prolonged wet spell occurred in the latter part of June. In this period secondary apple scab lesions became numerous, brown rot of green fruit, especially cherries, developed, the latter an unusual occurrence. It was at this time also that the initial infection of Cherry Shot-hole developed which later became epidemic. In late August frequent rains and prolonged damp periods initiated a serious outbreak of brown rot of the maturing early varieties of peaches. The backward weather delayed the normal ripening of the fruit and at the same time favoured the rot.

In Quebec, the fall of 1939 was generally mild. Snowfall in October was heavier than usual, but on account of mild weather and frequent rains, snow did not remain on the ground. There was very little snow in November and December and rainfall was heavier in the eastern than in the western part of the Province. Winter months in 1940 were colder than those of the past 5 years; snowfall was also very light and the ground in several districts was barely covered with snow. Fortunately there was no freezing and thawing and consequently meadows and pastures were in good condition in the spring.

Due to frequent rains and cold weather during the latter part of May and the early half of June, seeding was late throughout the Province, especially in eastern and northern Quebec. Growth was slow but pasturage was abundant. May and June were exceptionally wet; precipitation was much above the average for the last 16 years. In fact it was the wettest June since 1917. Serious damage was caused to crops on low lands. In certain localities potato tubers rotted in the soil. Although apple scab appeared between June 8-10, which is about 10 days later than last year, the disease was severe in neglected orchards. Even in well-cared for orchards it was difficult to control the disease on account of the frequent rains that delayed spraying. Fire blight appeared in early June and spread rapidly in certain localities.

Throughout the Province, frosts were reported during the summer months. During the last part of June heavy frosts caused considerable damage to young crops. Beans, corn, cucumbers, tomatoes, tobacco and potatoes suffered more than other crops. On the Island of Orleans a 50% reduction of the strawberry crop was attributed to late frosts. A hail storm on the last day of June injured orchard crops south of Montreal and field crops, especially tobacco, in the Three Rivers and Joliette districts.

July and August were rather dry. As the majority of days were cloudy, the temperature was low, August being exceptionally cool. Frosts were reported from various districts in July and August. Around Montreal, hollow heart was quite common in potatoes due to rapid and excessive growth. Garden crops suffered from various rots on account of the excessive moisture accumulated in the soil during June. Sand storms in July caused some damage to young growing crops around Joliette and Three Rivers.

Late blight appeared toward the middle of July in western Quebec and on the last days of July the first symptoms were observed in the lower St. Lawrence. However, in fields well exposed to winds, the disease did not spread until the latter part of August or September, while in other fields the disease became severe in early August, favoured as it was by cool nights and heavy dew. Although September and October were relatively dry months as compared to the same months during the last five years, the potato crop in a large number of fields was severely affected with late blight. August, September and October were remarkable for their long hours of sunshine, especially in eastern Quebec. Heavy frosts were registered in September and in a few localities snow covered the ground

early in October before crops reached complete maturity.

Winter conditions in New Brunswick during 1939-40 were somewhat less rigorous than the average. Since only 0.49 inches of rain fell during January and February, relatively little ice formed in the fields. There was no great depth of snow on the ground at any time, but an adequate blanket covered the fields from December 30 until March 31.

Grasses and clovers, strawberries, apple orchards and small fruits came through the winter in good condition.

Spring ploughing began May 7, and the seeding of wheat and oats May 15. During the last few weeks of May, rain storms were frequent, causing in many cases, on poorly drained soils, exceptionally late planting of grains and potatoes.

Satisfactory weather was experienced during the blooming period of apples which was moderately light. The development of perithecia in over-wintered apple leaves was considerably delayed and the number of fruit bodies developed per leaf was the lowest ever recorded. The first ascospore discharge was recorded May 25, when the blossoms were in the pink stage of development. Apple scab was unimportant in well-sprayed orchards but destructive in those poorly sprayed. Russeting was general in orchards sprayed with copper sprays during the pre-blossom stages when wet cool weather prevailed.

The first eighteen days of July were marked by only two light rainfalls, but the last thirteen days of the month were wet or cloudy. Powdery mildews were general and severe on certain varieties of grain during the last week of July. Leaf rust of wheat was first noted July 25, but this year's infection was of little importance. Stem rust of wheat was observed July 31, but only traces of the disease were noted throughout the season. Late blight of potatoes developed during the second week in July. The infection spread rapidly during the next two weeks and was then checked by dry weather conditions.

Almost four inches of rain fell in August but the downpours were confined to four specific dates. Crown rust of oats appeared August 9, in oat fields adjacent to buckthorn. This rust caused little if any damage except in oat fields adjacent to the alternate host.

September was characterized by frequent heavy rainfalls accompanied in many cases by strong winds. Much lodging of grain occurred. Late blight of potatoes became general and a serious epiphytotic was averted by a killing frost of 3 degrees on September 27.

Ten degrees of frost were recorded October 17 and 14 degrees on October 21. On the latter date one inch of snow also fell. A considerable acreage of potatoes and nearly all the root crop were unharvested at this

time. The ground thawed October 25, enabling harvesting of these crops. Frequent rains in this month kept the soil in a very wet condition. Ploughing ceased November 23.

Apple trees retained their foliage late on into the month of December.

The spring opened slowly in Nova Scotia, with vegetation somewhat backward in development. Early seeding of grain crops was possible in some areas, but wet soil forced late seeding in many. The summer was cool, but unfavourable to any serious epidemic or wind- or rain-borne diseases. Insect vectors of virus diseases were plentiful on potatoes and carrots. The mid summer was comparatively dry as well as cool, and root crops, strawberry plantings, etc., made their best growth during September when moisture and temperature conditions were more favourable.

Severe gales in September and frosts in mid October caused considerable damage to fruit and root crops. There were some indications of slight winter injury to trees from the October freezes.

The winter of 1940 was milder than the previous year in Prince Edward Island. With a good blanket of snow remaining throughout the season and no January thaw, winter killing of clovers, shrubs and garden perennials was at a minimum.

Mean temperatures for both April and May were higher than in 1939, but April was lower and May only slightly higher than the previous five year avorage. Total precipitation for the two months was also higher than the five year average and as a result sowing and planting operations were somewhat delayed. No discharge of brown rot or apple scab spores was noted before the blossom period and consequently these diseases were not severe during the past season.

June was warmer than the previous year and 2.77 inches of rain fell in contrast to 1.18 inches in 1939. This provided excellent growing weather and grain and early planted potatoes made vigorous growth during the month.

July temperatures were approximately normal and although August was a dry clear month the mean temperature was 4.6 degrees lower than in 1939. Only slight infections of leaf and stem rust of wheat, and barley occurred and crown rust of oats was almost non-existont. The light precipitation during August and the abundance of sunshine and clear days were factors in controlling any outbreaks of late blight.

During September 8.05 inches of rain fell as compared to 4.04 inches in 1939 and a mean temperature of 59.2 degrees for the month provided suitable conditions for late blight. As a result, at digging time considerable late blight rot was in evidence in fields that had not been sprayed late in the season.

October, while not as wet as the previous year, was considerably colder, thus the harvesting of potatoes, turnips and mangels was somewhat delayed. In some instances potatoes were slightly damaged in the fields from frost. Nine inches of snow fell during October and the first killing frost was recorded on October 17.

Maladies nouvelles ou d'importance notable

René O. Lachance

La rouille de la tige du blé ne fit que peu de ravages dans l'Ouest canadien grâce à l'utilisation de variétés résistantes dans les régions où elle sévit d'ordinaire. Dans le sud du Manitoba rares sont les fermiers qui utilisent encore des variétés de blé susceptibles à la rouille et dans l'est ils sont peu nombreux. Toutefois, dans quelques endroits plus à l'ouest et plus particulièrement dans la partie sud de la Saskatchewan centrale, la rouille a causé des pertes considérables aux emblavures tardives de variétés susceptibles. Dans l'est du Canada, la rouille de la tige a rarement causé des dégâts aussi légers que durant l'année qui vient de s'écouler. Ceci a permis de constater que les variétés résistantes à la rouille donnent des rendements quasi équivalents à ceux des vieilles variétés susceptibles même lorsqu'il n'y a pas de rouille de la tige.

Du Manitoba aux Maritimes inclusivement, il y eut et de la rouille de la tige et de la rouille couronnée sur l'avoine; toutefois l'infection fut plutôt légère. Au Nouveau-Brunswick où l'on a conduit une enquête d'envergure il a été possible d'établir une corrélation entre certaines zones infectées de rouille couronnée et leurs foyers d'infection respectifs consistant en des colonies de nerprun. En outre, l'on a mis en relief une fois de plus l'importance de l'épine-vinette dans la perpétuation et la dissémination de la rouille de la tige de l'avoine.

Au Manitoba, on a étudié de nouveau l'effet de la pourriture des racines (Helminthosporium sativum et Fusarium spp.) sur les rendements du blé. On a évalué les dommages à 16.6% en moyenne tandis qu'ils n'étaient que de 7.4% en 1939. La diminution du tallage et du rendement correspondait au pourcentage des pertes causées. Toutefois, grâce à de meilleures conditions de culture en 1940, un plus grand nombre de plants par rang ont atteint la maturité et les rendements par unité de surface furent meilleurs. En Alberta et en Saskatchewan, ces maladies étaient aussi répandues que d'habitude mais l'infection était moins grave.

La noircissure des épis était plus répandue que d'habitude dans les provinces des prairies particulièrement dans le blé commun. Une enquête a permis d'établir que 7.6% des chars de blé furent déclassés au Manitoba, 2.4% en Saskatchewan et 2 sur 5000 en Alberta. Une espèce d'Alternaria était l'organisme dominant. On a également observé des différences entre les variétés sous ce rapport.

La tache septorienne des feuilles du blé était répandue de façon inaccoutumée en Alberta. Le Septoria Tritici était présent sur ces taches presque à l'exclusion du S. nodorum.

Parmi les maladies des plantes fourragères la flétrissure bactérienne (Phytomonas insidiosa) de la luzerne devient de plus en plus

importante. On la rencontre communément dans les districts irrigués du sud de l'Alberta. Cette maladie fut particulièrement grave dans la région de Brooks où les luzernières de moins de trois ans furent infectées. Tous les champs de la variété Grimm à la Station expérimentale de Summerland, C.B., furent aussi gravement infectés. La pourriture phytophthorienne des racines (Phytophthora Cactorum) fut générale sur le trèfle d'odeur dans le sud de l'Alberta. On a noté l'apparition ou l'expansion des maladies suivantes dans les cultures: l'ascochytose (Ascochyta imperfecta) sur la luzerne dans le Québec; tache stagnosporienne (Leptosphaeria pratensis) sur la luzerne en Alberta; le stage parfait du même pathogène sur la luzerne en Alberta; l'ascochytose (Ascochyta lethalis) sur le trèfle d'odeur en Alberta; la tache stemphylienne (Stemphylium botryosum) sur la luzerne à Agassiz, C.B.

La pourriture des tiges et des épis fut très destructive dans la région à maïs de semence du sud-ouest de l'Ontario. Les organismes responsables de ces pourritures sont Nigrospora sphaerica, Fusarium moniliforme, F. gramineum et Diplodia Zeae.

Des taches des feuilles de la betterave à sucre, maladies nouvelles pour le Canada, furent observées à Sidney, C.B.; l'une d'elles est causée par Ramularia beticola et l'autre par Septoria Betae. Du sarrasin fut contaminé par Ustilago utriculosa provenant de la renouée à feuilles d'oseille, mauvaise herbe croissant avec cette récolte. La présence de ce charbon a déjà été notée dans l'avoine et le blé (P.D.S. 12: 4-5 et 17: 9). Un charbon rare au Canada (Ustilago Crameri) a été observé sur de la graine de millet de Hongrie ou sétaire italienne, provenant de Carnduff, Sask. La tache auréolée (Phytomonas coronafaciens var. purpurea) sur le brome inerme et sur le mil a été observée à Morris au Manitoba. C'est la première fois qu'un cas non-équivoque de cette maladie nous est signalé pour ces hôtes.

Le cerne bactérien ou flétrissure bactérienne des pommes de terre fut observé sur 89 fermes de l'important district de culture des pommes de terre du sud de l'Alberta tandis qu'on en avait observé 40 seulement en 1939; les conditions ont considérablement aidé à dépister cette maladie. On considère que l'utilisation de semence malade a été un facteur important de dissémination. La flétrissure bactérienne a augmenté au Manitoba en Ontario et dans l'Ile-du-Prince-Edouard, tandis qu'elle a diminué dans les provinces de Québec et du Nouveau-Brunswick. Vu que la plupart des cas se sont rencontrés sur des fermes où la flétrissure n'existait pas auparavant, on croit que cette maladie est enrayée à mesure qu'on observe sa présence.

Le mildiou des pommes de terre s'est manifesté à l'état épidémique dand l'Ontario en 1940; cette maladie a détruit au moins 20% des récoltes tardives de pommes de terre. Les pertes de 1940 sont équivalentes à celles de 1928 et de 1934. Le mildiou a causé quelques ravages ailleurs dans l'est du Canada, mais ce n'est qu'au Nouveau-Brunswick qu'ils furent réellement sérieux.

Les flétrissures et principalement la flétrissure verticillienne des pommes de terre ont retenu l'attention des pathologistes dans plusieurs provinces. Leur importance a été mise en évidence du fait qu'à l'état bénin elles causent une nécrose vasculaire des tubercules, nécrose qu'on n'avait pas imputée à la présence de ces pathogènes. D'un autre côté, une bonne partie de la nécrose du liber est due au virus de l'enroulement des feuilles.

Des renseignements additionnels sur les maladies à virus présentes dans les cultures de pommes de terre sont consignés dans une section à part préparée par M. D. J. MacLeod.

Les maladies des tomates d'intérêt spécial sont les suivantes: une tache annulaire sur les fruits de la tomate due à une infection secondaire ou abortive par Botrytis cinerea a été observée en Ontario; une nouvelle lignée biologique de Cladosporium fulvum fut découverte et la tomate Vetomold, une nouvelle variété immunisée contre les lignées 1-4, s'est montrée susceptible à cette nouvelle lignée. Cependant la Red Currant, une variété de L. pimpinellifolium, est résistante à cette nouvelle lignée biologique. Des variétés de tomates possédant cette résistance sont sur le point d'être introduites sur le marché. En Ontario, on a enrégistré des pertes considérables à cause d'une pourriture des fruits due à une espèce de Phytophthora.

Les autres maladies des légumes qui méritent une mention sont la pourriture violette des racines des carottes (Rhizoctonia Croccorum) observée à Comax, C.B.; la septoriose du céleri (Septoria-Apii-graveolentis) dans la vallée d'Okanagan, C.B.; la tacheture pourpre de l'oignon (Macrosporium Porri) en Nouvelle-Ecosse; une brûlure des feuilles de l'oignon (Mycospharella allicina) en Ontario; une tache des feuilles du pois (Septoria flagellifera) à Douglas, Ont.; et la veine géante de la laitue (virus) à Burlington, Ont.

La pourriture du collet du pommier est depuis longtemps une maladie importante dans la vallée d'Okanagan, C.B.; de récents travaux indiquent que cette maladie dans la majorité des cas est caussée par Phytophthora Cactorum. Le blanc du pommier (Podosphaera leucotricha) se rencontre dans tout le Canada, mais il est particulièrement grave dans la vallée d'Okanagan et on doit avoir recours aus arrosages pour prévenir les taches des fruits. D'un autre côté les arrosages contre la travelure (Venturia inaequalis) sont nécessaires partout au Canada. En 1940 le tavelure fut passablement grave dans les vergers non arrosés, mais dans les vergers arrosés on a réalisé une protection très efficace contre cette maladie. La pourriture brune (Sclerotinia americana) a causé des pertes inaccoutumées de cerises, de pêches et de prunes dans la péninsule du Niagara, à cause de la température pluvieuse du début de la saison.

Les maladies à virus des arbres fruitiers ne cessent d'attirer l'attention des pathologistes. La mosaique du pommier semble prendre, decidément, plus d'expansion au Nouveau-Brunswick et en Nouvelle-Ecosse.

On a prouvé récemment que la fausse piqûre, maladie observée pour la première fois en Nouvelle-Ecosse en 1934, est causée par un virus. Plusieurs maladies nouvelles du cerisier et du prunier présentes dans la vallée d'Okanagan, C.B., ont été décrites au cours des doux dernières années, et on a prouvé que quelques-unes d'entre elles sont causées par des virus.

On a trouvé en abondance le Rhizosphaera Kalkhoffii sur les aiguilles de l'épinette bleue provenant de Knowlton, Que.; ce champignon peut être destructeur. La brûlure du saule a été observée sur quelques arbres à Abbotsford, C.B. Physalospora Miyabeana, surtout le stage Gloeosporium fructifiait abondamment sur les chancres des brindilles. Fusicladium saliciperdum était également présent sur le pétiole d'une feuille récoltée au printemps, mais plus tard il fut impossible d'en trouver. Des enquêtes faites en d'autres endroits nous font croire qu'il n'y a pas d'autre foyer où cette maladie se développe.

Les nouvelles maladies des plantes ornementales rapportées sont la pourriture grise du bulbe de l'iris (Sclerotium Tuliparum) en C.B. et la tache bactérienne des feuilles (Phytomonas primulae) sur Primula polyantha observée aussi en C.B.

Recording Phenological Data

R. C. Russell

Phenological data were collected again by the same persons, namely B. Peturson, R. C. Russell, and M. W. Cormack at Winnipeg, Saskatoon, and Edmonton respectively.

The lists of plants observed at the three places diverge considerably this time, but each observer is selecting plants which come under his observation most regularly. This tends to make the data more valuable as there is less chance of a flower escaping notice for several days after it first begins to bloom.

The data are assembled in the form of a table, which appears on the following page. In the first column under each place are shown the dates on which the plants were first seen in flower. In the second column figures followed by the letter E or L show how much earlier or later than the average date this was. The average is based on as many years observations as are available for that particular plant and place, varying from three to five years. A zero in the second column signifies that the plant bloomed at the average date.

Somewhat similar data showing the time of seeding, emergence, heading and harvesting of Thatcher wheat at the same three places is given.

It may be seen that the first part of the season was relatively late at all three places. At midseason, however, it was somewhat earlier at Saskatoon than usual. Then followed a relatively cool period in the latter half of July with the result that the harvest was somewhat later than usual.

With each successive year's data our records will become more valuable. For one thing we can compute more reliable averages. Moreover we have not had records for enough years on some of the species to compute an average date for the commencement of flowering.

Summary of phenological data taken at Winnipeg, Saskatoon, and Edmonton in 1940.

Species	Winnipeg		Saskatoon		Edmonton	
	a	b	a	b	a	b
Pulsatilla Ludoviciana	-	-	20/4	3 L	1/5	3 L
Populus tremuloides	30/4	1 L	27/4	5 L	2/5	9 L
Phlox Hoodii	-	-	30/4	2 L	-	-
Acer Negundo	10/5	2 L	6/5	0	10/5	8 L
Betula papyrifera	-	-	12/5	3 L	16/5	8 L
Thermopsis rhombifolia	-	-	7/5	2 E	-	-
Amelanchier alnifolia	20/5	4 L	12/5	0	20/5	6 L
Hierochloe odorata	20/5	1 L	15/5	0	-	-
Prunus pennsylvanica	-	-	17/5	3 L	22/5	6 L
Prunus americana	19/5	5 L	-	-	-	-
Pyrus baccata	24/5	?	-	-	-	-
Smilacina stellata	29/5	4 L	19/5	1 E	26/5	7 L
Viola canadensis	-	-	19/5	2 L	24/5	8 L
Prunus melanocarpa	29/5	-	24/5	1 L	28/5	5 L
Svida sp. (Cornus sp.)	31/5	1 L	28/5	0	4/6	5 L
Crataegus coccinea	28/5	?	-	-	-	-
Elaeagnus commutata	-	-	31/5	0	7/6	6 L
Diholcos bisulcatus	-	-	2/6	5 E	-	-
Lonicera glaucescens	-	-	29/5	?	14/6	?
Viburnum lentago	3/6	?	-	-	-	-
Viburnum trilobum	-	-	-	-	10/6	2 L
Anemone canadensis	7/6	2 E	7/6	0	21/6	5 L
Heuchera hispida	-	-	5/6	1 E	-	-
Achillea lanulosa	-	-	5/6	3 E	29/6	6 L
Rosa alcea	-	-	14/6	1 E	-	-
Galium boreale	-	-	11/6	?	19/6	?
Thalictrum dasycarpum	4/6	?	-	-	-	-
Gaillardia aristata	-	-	15/6	4 E	-	-
Agrimonia striata	-	-	-	-	2/7	?
Bromus inermis	24/6	4 L	25/6	3 L	4/7	10 L
Campanula petiolata	-	-	18/6	3 E	-	-
Symphoricarpos occidentalis	-	-	-	-	5/7	3 L
Phleum pratense	13/6	?	-	-	6/7	?
Psoralidium argophyllum	-	-	2/7	4 E	-	-
Zizia aurea	14/6	?	-	-	-	-
Chamaenerion spicatum	-	-	-	-	10/7	?
Lactucapulchella	-	-	6/7	4 E	19/7	?
Grindelia perennis	-	-	21/7	0	-	-
Oligoneuron canescens	28/7	1 E	20/7	2 E	-	-
Solidago canadensis	16/7	?	-	-	20/7	?
Axyris amaranthoides	22/7	?	-	-	-	-
Aster crassulus (white)	-	-	-	-	3/8	?
Aster laevis (purple)	-	-	22/7	7 E	6/8	2 L
Thatcher Wheat (early seeded)						
Sown	24/4	-	22/4	2 L	9/5	11 L
Emerged	3/5	-	8/5	2 L	16/5	7 L
Headed	26/6	-	24/6	2 E	7/7	6 L
Harvested	1/8	-	8/8	8 L	20/8	7 L

I. DISEASES OF CEREAL CROPS

WHEAT

HEAD DISCOLORATION (Alternaria, etc.). Although 1940 was not a root-rot year in Sask., head troubles were conspicuous. Fairly soon after the wheat crop headed, many samples of bleached or partially bleached heads were received. In the partially affected heads, sometimes the upper half, and sometimes the lower was injured. These troubles were attributed, in some cases with supporting field evidence, to drought or hot dry winds, frost, or slight hail injury. These were followed, until the grain was cut, by specimens showing head discolorations, involving the glumes and usually the rachis. The discolorations were referable to kernel smudge (Helminthosporium, Fusarium, Alternaria), black chaff, and glume blotch (Septoria). (T. C. Vanterpool).

Head discoloration was widespread in Sask. on Apex and was severe on heavy and late crops of this variety. It was also noted in Red Bobs at the University, Saskatoon. Discoloured kernels from affected heads yielded mostly Alternaria, but also a few Helminthosporium spores, when they were placed on moist sterile filter paper in a Petri dish. Head discoloration was almost completely absent in Que., N.B., N.S., and P.E.I.; traces were recorded at Ste. Anne de la Pocatiere, Que., and at Truro and Nappan, N.S.; 5% of the heads were discoloured at Boudreau, N.B.

ERGOT (Claviceps purpurea). A trace to slight infection was found in 6 fields out of 164 examined in Alta., and also in the plots at Edmonton and Lacombe. An examination of about 35 fields in the Alameda-Northgate area, Sask., revealed ergot in every field of durum wheat, and in some, 0.5 to 1.0% of the heads were infected; no ergot was found in common wheat. A trace was recorded in wheat at Hartland and Boudreau, N.B.

ROOT ROT (Cryptoascus sp.) was abundant on Huron in one section of a field at Charlottetown, P.E.I.

POWDERY MILDEW (Erysiphe graminis) moderately infected Sun winter wheat in May in the plots at Sidney, B.C. It was general in plots at Edmonton, infection ranging from a trace to moderate; infection was moderate on late-maturing varieties at Lethbridge. A plot of Thatcher at Aylsham, Sask., was severely infected. Powdery mildew was common to abundant in Que. It was severe on Little Club and Thatcher in the Uniform Rust Nursery, Fredericton, N.B.

HEAD BLIGHT (chiefly Fusarium spp.). Slight to moderate infections were observed at Vegreville and in the plots at Lethbridge, Alta. Blighted heads of the Fusarium type were fairly common in fields at Melfort, Tisdale, and Pontrillas, Sask. and scabby kernels were present in threshed grain from Indian Head. Material showing blight due to Helminthosporium sativum was received from Gronlid and Scott. In Man., 2% of the heads were affected at Roblin, as well as a trace at Binscarth (Fusarium Scirpi var. acuminatum and Helminthosporium sativum isolated)

and at Winnipeg (F. Poae, F. Scirpi and F. Scirpi var. acuminatum). About 10% of the heads were said to be affected in winter wheat in western Ontario; isolations were made from two samples, one from Ailsa Craig (F. graminearum) and one whose location was not stated (F. graminearum and H. sativum). Diseased specimens were collected at Ottawa (F. graminearum and F. Poae). Head blight was virtually absent in Que., N.B., N.S., and P.E.I.; 3% of the heads were affected at Gillespie, N.B. (F. graminearum); a trace occurred in Garnet at Truro, N.S., and a trace was present at Charlottetown, P.E.I. (F. graminearum and F. Poae). The fungi reported within the brackets were isolated and determined by W. L. Gordon.

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.). No survey was made in the southern part of Alta. owing to dry conditions prevailing there; the disease was about as prevalent as usual in the central and northern sections Infection in 85 out of the 164 fields examined was a trace in 44 fields, slight in 25, moderate in 12, and severe in 4.

All three major root rots of cereals were less common than usual in Sask. Common root rot was observed in 173 out of 188 fields examined. The average infection was moderate and did not vary greatly over the province, except in a few fields or districts In three districts, Grenfell, Saltcoats and Alameda, wheat was patchy and common root rot was conspicuous at harvest time on the remaining plants. Data from several rotations at Illustration Stations indicated that infection was less severe than in 1938 or 1939. T. C. Vanterpool reports that when wheat plants were collected at harvest time from browning root rot (Pythium spp.) areas and from normal areas respectively, from six fields under observation, and readings were made for common root rot, the latter was no more severe on plants attacked by Pythium than those which came from the healthy areas.

The effect of common root rot on the yield of wheat was studied again in Man., the same procedure being followed as in 1939 (see P.D.S. 1936-7). Samples were collected from 60 fields in 6 soil zones. For each field, the plants were classified according to the severity of root rot and the number of plants and weight of grain in each class were determined. The average loss due to root rot in the 60 fields was 16.6% as compared to 7.4% in 1939. The number of tillers per plant and the yield of grain per head were both reduced in proportion to the extent of root rot injury. Due to better growing conditions in 1940, however, more plants per row reached maturity and the yield per unit area was greater. (J. E. Machacek)

Common root rot caused slight damage to Kharkov winter wheat at the Experimental Station, Ste. Anne de la Pocatiere, Que.

KERNEL SMUDGE (Helminthosporium etc.) was far more prevalent this year than usual in the Prairie Provinces, particularly on common wheat, according to a survey of car-inspection records from Aug. 31 to Oct. 1, 1940

at Winnipeg. The records of 1,000 cars of common wheat from as many different points in Manitoba showed that 7.6% of these were degraded on account of smudge. Infection in western Man. was much more abundant than in 1938, a previous severe smudge year. In Sask. the percentage degraded in 1,000 cars was but 2.4%; while out of 5,000 cars from Alta. only 2 cars were recorded as having smudged seed in them. Alternaria spp. were by far the most common fungi associated with infected seed.

Examination of seed samples from the co-operative wheat variety tests conducted in all three Prairie Provinces revealed that the varieties in the test showed considerable differences in susceptibility to kernel smudge. These differences are set forth below:-

Variety	Man.	Sask.	Alta.
Apex Selection	6.9%	4.0%	0.3%
Thatcher Selection	4.3	2.0	0.9
Thatcher	3.9	1.9	0.7
Marquis	3.6	0.4	0.3
Regent	1.9	0.7	0.1
Renown Selection	1.0	0.2	0.5
Regent Selection	0.6	0.2	0.1
Garnet	0.0	0.0	0.0

SPOT BLOTCH (Helminthosporium sativum) slightly damaged the leaves and heads of Marquis from Saskatoon, Sask. Infection was a trace at Homewood and slight at Crystal City, Sperling, and Winnipeg, Man., on durum wheat.

YELLOW BLOTCH (Helminthosporium Tritici-repentis). A trace was found on durum wheat at Lyleton, Man. (J. E. Machacek)

Nigrospora sphaerica (Sacc.) Mason has been found on samples of seed from several points in Sask. It was also obtained from oat seed. (R. C. Russell)

TAKE ALL (Ophiobolus graminis) caused slight damage in a field of winter wheat at Duncan, B.C., and moderate damage in the University plots, Point Grey.

Take all caused relatively little damage this year in Alta. even in areas, where it has often proved very destructive. It was observed in 23 fields out of 164 examined; the damage was estimated to be a trace in 13 fields, slight to moderate in 9 and severe (30%) in one, which was at Waskateneau.

Take all was found in single fields at 3 scattered points in Sask., viz. Gronfell, Guernsey and White Fox. At the latter place in a 4-year rotation, the disease was on single plants as well as in patches up to 6 feet across. A trace was also present at the Illustration Station at Pelly.

BASAL GLUME ROT (Phytomonas atrofaciens). A trace of infection was found in 3 fields in Alta. and in 3 in central Sask. A sample from Lloydminster showed some shrivelling of the kernels. Besides, it was common in foundation and elite stock throughout the province.

At Miniota, Man., about 25% of the heads were half destroyed by basal glume rot; hail damage was also present. (W. A. F. Hagborg).

BLACK CHAFF (Phytomonas translucens f. sp. cerealis) slightly infected a field at Austin, out of 65 examined in Man. The organism was isolated. (W. A. F. Hagborg)

STRIPE RUST (Puccinia glumarum) was severe on Pride of Alexandria, but no infection was found on Sun, Ballards, and Red Rock in the rod-row plots at Sidney, B.C., in May.

STEM RUST (Puccinia graminis) was first observed at Edmonton, Alta. on July 30, as a fairly severe local infection on Red Bobs. On Aug. 15, there was a trace to slight infection on most stands in central Alta., and some late-maturing fields, along the eastern side of the province, were moderately infected. Little or no damage was caused, since rust development was retarded by the hot, dry weather, which prevailed during most of August. Infection of the leaves by stem rust was unusually common.

Stem rust was first found at Indian Head, Sask., on July 6. Since rust resistant varieties are grown almost exclusively in south-eastern Sask., rust infection was very light. In south-central Sask., the same was true except in a few areas, as for example about Big Beaver, where damage was severe in the later crops of Ceres and Marquis, which represented 30% of the acreage. Thatcher was also lightly infected. Stem rust was found on July 13 at Saskatoon, and later, traces were present in most fields of Marquis and Reward throughout the central and northern parts of the province.

Abundant precipitation occurred throughout Manitoba during June, 1940. A lush heavy crop developed and moisture conditions generally were very favourable for the germination of rust spores. Rust development, however, was not favoured by the prevailing temperatures which averaged from 2 to 4°F. below normal for this month. Northerly winds prevailed during June over the prairie region of the United States and Canada and consequently the northward drift of rust spores was retarded by these unfavourable winds. Both temperature and moisture conditions during July were quite favourable for rust development.

Stem rust made its appearance in Manitoba about the same time as in 1939. The first infections were observed at Portage la Prairie and at Winnipeg on July 3, and shortly thereafter infections were observed on susceptible wheat varieties at Morden and Brandon. It was almost impossible to find any stem rust on wheat except at the Experimental Stations where some susceptible varieties were grown. Most of the wheat acreage in

Manitoba was sown to rust resistant varieties and in those fields stem rust made no headway. It is not known definitely what percentage of the acreage was sown to susceptible wheat varieties, but it must have been exceedingly small for it was almost impossible to find any farmers' fields of susceptible wheat. Of several hundred fields examined this year, only a few fields were known to be sown to susceptible varieties. One of these fields was located about 60 miles north of Winnipeg, and was sown to Reward wheat. On July 20, the severity of infection in this field amounted to about 5%. Although this field was sown fairly early, the severity of infection averaged about 75% when the infection had reached its maximum. The grain from this field weighed 57.5 pounds per bushel, whereas grain of rust resistant varieties from surrounding fields weighed from 62 to 64 pounds per bushel. The damage caused in this instance amounted to 25% or more and it is not at all unlikely that this figure fairly well represents the damage that would have resulted generally in this area had susceptible varieties been grown. In the Winnipeg area, plots of Marquis wheat that were protected from rust with sulphur dust yielded about 18% more than comparable plots of the same variety which were exposed to natural infections of stem rust. At Morden and Brandon, the rust resistant varieties out-yielded the old standard susceptible varieties by about 30 and 12% respectively. This reduction in yield was no doubt due to stem rust which averaged about 70% at Morden and 50% at Brandon on the susceptible varieties. Stem rust was much less prevalent in the northern half of the agricultural area of Manitoba. Although it was present throughout this region, it arrived too late and did not develop in sufficient intensity to affect the yields of susceptible varieties. In the northern areas of the province, the susceptible varieties yielded as much as the rust resistant varieties in experimental plots.

Generally, stem rust of wheat caused only very slight damage in southern Manitoba chiefly on account of the absence of susceptible varieties in any quantity. In the northern half of the province, stem rust probably caused no damage. Had the wheat acreage in Manitoba been sown to susceptible varieties as in former years, it is probable that stem rust would have caused appreciable damage in southern Manitoba this year, but in the northern sections of the province the damage would have been only slight.

Durum wheat varieties were not damaged by stem rust to any appreciable extent. Only traces of stem rust were present in most fields; in a few very late fields the infection averaged as high as 20%. (B. Peturson)

Stem rust was common to abundant in fields examined in Que. (I. H. Crowell) In general, stem rust was very light in N.B.; a 5% infection was recorded at Kedgewick and a trace in two out of 28 fields examined. In the plots, most susceptible varieties showed only a trace or light infection; however 65% was noted on Garnet at Fredericton (S. F. Clarkson). Traces to low percentages of stem rust were recorded in the plots in N.S.,

the highest infection being 40% on Garnet at Lower South River (J. F. Hockey). Stem rust was also surprisingly scarce in P.E.I. this year; a 15% infection was recorded at Palmer Road (G. W. Ayers). Rust resistant varieties, particularly Coronation, are rapidly replacing the older varieties in P.E.I., such as White Fife and Huron. Although the 1940 season was very favourable for wheat, and stem rust was very slight, Coronation yielded as well as these older varieties, when it was grown on reasonably good land.

LEAF RUST (Puccinia triticina) slightly infected wheat in the plots at Sidney, B.C. Leaf rust was relatively scarce in Alta. However, an exceptionally severe local infection occurred in the winter wheat plots at Lacombe in late July and a trace to slight infection developed later in the adjacent plots of spring wheat.

Leaf rust infection was very light in Sask. and was virtually absent in the western part. However, it was fairly common on Thatcher and was heavy on some late crops in the north-eastern section. A 5% infection was recorded on durum wheat at Bengough.

Leaf rust appeared in Manitoba in 1940, on July 3, fully two weeks later than normal Although present throughout the province, it caused no appreciable damage. The heaviest infections occurred in the extreme south-eastern part of the agricultural area of the province, where infections averaged as high as 30%; elsewhere in the province only traces occurred. Even in the fields where the heaviest infections occurred, no appreciable damage was caused owing to the late arrival and slow development of the rust. The crop had almost reached maturity before rust infections became heavy. (B. Peturson)

Leaf rust was common to abundant in fields examined in Que. (I. H. Crowell). An occasional high infection was observed in the fields examined in N.B.; in the Uniform Rust Nursery at Fredericton, 90% was recorded on Thatcher (S. F. Clarkson). Leaf rust infection was light in N.S.; but on susceptible varieties at Nappan, 40% of rust was recorded (J. F. Hockey). Leaf rust was fairly heavy late in the season in P.E.I. on susceptible varieties such as Huron. (R. B. McLaren)

BROWNING ROOT ROT (Pythium spp.) on summer fallow was moderate both in severity and distribution during 1940 in Sask. Meteorological data did not reveal any deviation from the normal in rainfall, temperature, sunshine or evaporation sufficiently great to account for this decrease in the disease compared with the last two or three years. The explanation may be the complete absence of high temperature extremes accompanied by dry winds such as often occur during June or the last few days of May. In previous years, conspicuous browning root-rot symptoms have frequently appeared on the fallow crop following two or three days of hot, dry winds. Their appearance has been considered to be due to the increased demand in the absorption of water made upon the root system, and the inability of the impaired roots to meet this demand. At the critical time in June

of 1940, it is possible that over wide areas where browning is usual, the affected root systems could at all times supply the demands made on them for water by the leaves above. Where this demand could not be met, above-ground symptoms showed up.

In the central area around Saskatoon for long distances, an infected field was found only here and there. Further north, infestation was more general, but only moderate in severity when compared with a so-called bad browning year. Moderate infestations, with an occasionally severely attacked field, were found in the Prudhomme to Totzke area, around Naicam, Tisdale to Birch Hills, St. Louis to Cudworth, and Duck Lake to Rosthern. An authoritative report of the disease in the Paynton to Maidstone area was also received.

In some localities where browning has been common before, phosphate fertilizers were being used and probably helped to explain the absence or only slight infestations of the disease this year. In other districts, notably around Watson, slight browning root rot was scattered, but most of the leaf discoloration was caused by early drought.

From observations in two fields, it seemed that plants in browning areas are more susceptible to late spring frosts than plants in normal areas.

In six fields kept under observation, the diseased areas were definitely later in maturing than the normal areas. The differences followed the rough outline map made in June demarking diseased and healthy areas. At the same time the diseased plants were as tall as or in two instances taller than healthy plants, though they had not tillered as well. This suggests that the water supply is the limiting factor.

In the majority of diseased fields when cutting is done by the binder, the grain of the diseased areas is usually immature when cut and thus both yield and grade are reduced; however, harvesting by the combine may aid in reducing losses by allowing the grain in diseased plants to ripen thoroughly before being cut.

It is interesting to note that in the Dakotas, R. Sprague (Pl. Dis. Reporter 24:344-345. 1940) isolated Pythium arrhenomanes from early-sown wheat. He also obtained the fungus from oats, sorghums, corn, pigeon grass (very common) and a number of other grasses. He states that "with fresh material it is suspected that Pythium would be found in greater amounts than the few isolations that were possible with advanced specimens received."

The following species in order of frequency were isolated from field material collected in June in Sask.: Pythium arrhenomanes, P. tardicrescens and P. aristosporum. The last named fungus was isolated

from the roots of wheat seedlings grown in four separate samples of soil obtained from the Swift Current station. No browning root rot has hitherto been reported from the extreme south-west of the province, but this confirms the view that all arable soils of Saskatchewan contain species of Pythium parasitic to wheat. (T. C. Vanterpool)

The Dominion Laboratory survey in southern Sask. embraced the districts of Indian Head, Grenfell, Balcarres and Qu'Appelle. Out of 16 fields, 6 were free from disease, 6 showed a trace, and 4 were slightly infected. Moisture was good at seeding time, but the area received no rain after June 15. The usual field symptoms were absent or were obscured by drought injury. In the central and east-central parts of the province including the Saskatoon, Dundurn, Lanigan, Humboldt, Spalding, Valparaiso, and Melfort districts, 25 fields were healthy, 4 showed a trace, 5 slight, 17 moderate and 2 severe infection. In a field of Regent at Valparaiso, field symptoms were typical and lesioning was pronounced, while in a field of Thatcher on the same farm there were no conspicuous field symptoms but root lesions were present. The field was broken 3 years previously and the preceding crop was crested wheat grass. The disease was less severe than in 1939. Infection was probably as widespread as usual, but the areas of severe infection were smaller and more scattered.

A light infection of browning root rot was reported in the Portage la Prairie district, Man., in June. (J. E. Machacek)

GLUME BLOTCH (Septoria nodorum) was observed in 57 fields out of 164 examined in Alta. Infection was a trace in 35 fields, slight in 21, and moderate in one. In plots at Lacombe, infection was a trace to moderate, while in those at Edmonton, infection was a trace on most varieties, but it was severe on Apex and certain hybrid lines. The disease was recorded on wheat heads from 5 scattered points in Sask. In one collection from Rex, T. C. Vanterpool notes that the spores were unusually long, measuring 43.6 x 3.2 u. A trace of glume blotch was observed on Huron in Queens' Co., P.E.I. (R. R. Hurst)

SPECKLED LEAF BLOTCH (Septoria nodorum and S. Tritici) was unusually prevalent this year in Alta., but severe infections did not develop until late in the season and the damage was probably slight. Infection was a trace in 21 fields, slight in 46, moderate in 14, and severe in 8.

Out of about 25 collections examined microscopically only 2, from Edmonton and Lacombe respectively, were Septoria nodorum and the remainder were S. Tritici. Pycnidia were relatively scarce on the S. nodorum material and it is possible that this species caused some of the leaf spotting in the many fields where no pycnidia were observed. (M. W. Cormack). A slight infection was observed in May on winter wheat at the Experimental Station, Sidney, B.C.; typical Septoria Tritici was present. (W. Jones and I. L. Conners)

Speckled leaf blotch caused slight damage in 3 fields at Tisdale, Melfort, and Young, Sask.; S. nodorum was present.

BUNT (Tilletia caries and T. laevis). A summary of the bunt situation in Western Canada was prepared from the records of the Western Grain Inspection Division and kindly supplied by Wm. Popp.

Table 1. Wheat Bunt in Western Canada

Summary of Inspections from August 1 to October 31, 1940.

Class of Wheat	Cars Inspected	Cars Graded Smutty	Percentage Smutty
Hard Red Spring	39,551	106	0.3
Garnet	735	4	0.5
White Spring	-	-	-
Amber Durum	654	5	0.8
Alberta Red Winter	169	8	4.7
All classes of wheat	41,133	124	0.3

The bunt situation appears to have changed in Western Canada but little over last year. The amount of bunt in winter wheat, however, is the lowest it has been in a decade and may indicate that the seed treatment campaign in the winter wheat districts in Alta. is bringing beneficial results.

About 3% of the heads were affected in a field of Golden Chaff at Soda Creek, B.C.; 2 and 3% of the heads were affected in 2 fields respectively near Maple Creek, Sask. It was also severe in hybrid material of Marquis x Pilot naturally infected in the University plots, Saskatoon.

About 25% of the heads were affected in one field at St. Ignace, Kent Co., out of 28 examined in N.B.

LOOSE SMUT (Ustilago Tritici) infection was 1% of the heads in 3 fields and a trace in 8 others out of 164 examined in Alta. It was reported in 15 fields out of 181 examined in Sask. and seemed less prevalent than in 1938. However, it was present in 11 out of 51 plots of foundation and elite seed throughout the province; 11 plots of Thatcher were free from infection. Traces were reported on Thatcher at Myrtle and McLeod, Man. and on Mindum from Crystal City, Homewood and Sperling.

Loose smut was common everywhere in Que. The average infection was about 0.5% in N.B., the highest being 10% at Oliver Siding; 10% of the heads were affected in a field at Glenkeen, N.S.

DROUGHT DAMAGE was reported as severe from Cromer and Elkhorn, Man.

FROST INJURY. Abortion of several of the lower spikelets was observed on heads of wheat and barley in a field of mixed grain at Shipman, Sask. It was attributed to a frost on July 10.

HAIL INJURY caused moderate damage in Sask. in 1940. The plants left in affected fields showed some of the following symptoms: 1. Lower stem green but with white lesions, neck and head bleached and empty. 2. Lower stem green, neck bleached and head empty. 3. Lower stem green, neck green, upper half of head bleached and empty. 4. Heads shattered and distorted. 5. Empty heads often overgrown by moulds. Hail damage was reported as severe at Elkhorn, Man.

KINK (non-parasitic) caused slight damage in the High River and Okotoks districts, Alta. (L. E. Tyner)

WHITE TIP (non-parasitic). Slight damage was observed in 2 fields in Central Alta.; a trace was also present in the plots at Lacombe.

SEED DISCOLORATION (sap of Salsola Kali var. tenuifolia) was observed in a seed sample from Weyburn, Sask. In the harvesting and threshing operations, fragments of Russian thistle and other weeds are carried along with the grain. The sap of Russian thistle, when exposed to air under moist conditions, turns quite black or purple, presumably due to the presence of oxidizing enzymes. When wheat seed comes in contact with such fragments, blue or usually black blotches appear at the points of contact. Wheat seed has been stained in this manner experimentally. Other weeds may cause staining, but usually the discoloration is some shade of green. (P. M. Simmonds)

OATS

HEAD DISCOLORATIONS (Alternaria spp.) were almost completely absent in Que. (I. H. Crowell). A trace of discoloration was found on Erban oats in York Co., N.B.; the cause appeared to be Alternaria (S. F. Clarkson and T. Johnson).

ANTHRACNOSE (Colletotrichum graminicola) was abundant on some plants in a field in Que. (I. H. Crowell)

POWDERY MILDEW (Erysiphe graminis) slightly infected R. L. 1114 at Ste. Anne de la Pocatiere, Que.

COMMON ROOT ROT (Fusarium spp. chiefly) caused slight damage in 18 fields out of 23 examined in Sask.; it caused premature ripening of the individual plants, many of which bore sporodochia of Fusarium at their bases.

LEAF BLOTCH (Helminthosporium Avenae) was found in 15 out of 66 fields examined in Alta.; infection was a trace in 9 fields, slight in 4, and moderate in 2. A trace was observed at Ninga and Souris, Man. Leaf blotch was common throughout Que. The average leaf area affected in 186 fields was 3.19%, while in 13 variety tests it was 0.56%; the highest scores recorded were 2.67% at Ste. Anne de Chicoutimi and 2.02% at Peribonca. (I. H. Crowell and D. Leblond)

Leaf blotch was recorded in 75 fields out of 119 examined in N.B.; average infection was estimated at 3% (S. F. Clarkson). The leaf spotting caused by H. Avenae in N.B. was not clearly distinguished from that caused by Septoria Avenae. In 6 field collections, H. Avenae was reported by W. A. F. Hagborg in 5 and S. Avenae in 1, while in 3 collections from the Uniform Rust Nursery at Fredericton, Septoria Avenae only was noted. Leaf blotch was slight to moderate on most varieties at Charlottetown, but was almost absent in plots at other points in P.E.I.

NEMATODES (Heterodera schachtii). The nematode situation in Ont. differed little this year from last. The amount of nematode injury in Waterloo County was about the same as last year although nematodes were worse in some fields than in previous years, while in others the damage was less than it had been previously. Nematode-infected samples were again received from several localities throughout the province, but in no case were any serious outbreaks recorded. (J. E. Howitt)

HALO BLIGHT (Phytomonas coronafaciens). A trace to slight infection was recorded in 33 out of 66 fields in Alta.; a trace was also present on many of the varieties at Lacombe. Halo blight was rarely found in Sask. in 1940 and then only a trace, while last year it was common (T. C. Vanterpool). The disease was found in 32 fields in Man.; infection increased greatly as the season advanced and a maximum of 30% of the leaf area was affected in 4 fields in different districts. (W. A. F. Hagborg)

CROWN RUST (Puccinia coronata) was very scarce in Man. in 1940; traces only were found in 3 fields in southern Man., early in August (B. Peturson). Inspection of 8 varietal tests in Lincoln Co., Ont., showed that stem rust was more prevalent than crown rust in this area (G. C. Chamberlain). Crown rust occurred in small amounts this year in Quebec, but it was quite uniformly distributed including the Lake St. John area. It was estimated that the average leaf area infected was 1.96% in 186 fields and 0.80% in the 13 variety tests. (I. H. Crowell and D. Leblond)

Cereal crops were sown rather late in N.B., especially in Westmoreland Co., on account of a wet, cold, backward spring. At the time of the survey, however, most of the province was suffering from drought, except along the Saint John River Valley, especially above Woodstock, where moisture was plentiful. Leaf rust was somewhat lighter than last year. Out of 120 fields examined no rust was recorded in 91, traces in 15 and 25-65% in 6. A notable fact was that the heavily infected fields were grouped at 4 points, at two of which local infection from buckthorns are known to occur. These points were Springhill, infection 25-60%; St. Andrews, 10-40%; Albert, 5-25%; and Hopewell Cape, 65%. At Springhill, heavy infections have been recorded each year since 1936 and buckthorns were located in the area in 1937. At St. Andrews, heavy outbreaks were observed in 1939; observations in that year and since have

uncovered extensive buckthorn hedges and large escaped trees. Hopewell Cape and Albert were on a route not previously traversed and buckthorns have yet to be located.

Leaf rust infection in the Springhill area was definitely more limited in 1940 than in 1938, when the area was carefully surveyed. In the latter year, leaf rust was heavy in a mile radius about the buckthorns on the local golf course and across the Saint John River in a strip about a mile wide and four miles long, the infection ranging from 65 to 80%. In 1940 a field on the Springhill side of the river about ½ mile east of the buckthorn bushes showed 65% rust, while in the variety test at the Municipal Home, Nashwaaksis, about 1½ miles across the river, only a trace of leaf rust developed. The aecia of Puccinia coronata wore actively discharging spores from the buckthorn bushes on June 20-23, while the prevailing winds were from the east during this period. These facts may explain why heavy rust infection was confined to the Springhill side of the river. A new location for buckthorns was found at Fredericton. (S. F. Clarkson)

Leaf rust was absent or traces only were present in the few fields examined in N.S. The highest infection recordod was 10% in the plots at Glenholme, where in 1939 it was epidemic (J. F. Hockey). Leaf rust was not prevalent this year in P.E.I.; infection ranged from 10-20% on susceptible varieties at Palmer Road, and was still less at Charlottetown.

STEM RUST (Puccinia graminis) was extremely scarce again in Alta.; a trace was found in 2 fields on Aug. 20 in central Alta. Stem rust was observed in Sask. in only one field, viz. at Lipton; infection was very light.

Traces of stem rust were present on oats throughout Manitoba in 1940. Almost no stem rust occurred on rust resistant varieties, such as Vanguard and Anthony, which are now extensively grown in Manitoba. Only traces of rust occurred on early susceptible varieties. However, in southern Manitoba, average infections ranged as high as 30% on very late sown susceptible varieties. These higher infections occurred only in fields which ripened in late August. These late fields were somewhat damaged by rust, but they represent possibly less than 1% of the oat fields. The bulk of the oat crop was not damaged at all by stem rust. (B. Peturson)

Stem rust was almost completely absent in Que., although traces were frequently found even in the Lake St. John area. In 3 fields near Chambly, stem rust was very abundant, although it was not found elsewhere in the vicinity. (I. H. Crowell)

Stem rust was observed in only one field in N.B., located at Milltown, where the infection was 65%; a barberry bush was found 0.3 miles from the field. The importance of the barberry in initiating outbreaks of stem rust is evident from observations at other points. At

Douglastown, stem rust was heavy on oats in nearby fields in 1937, 1938, and 1939, while a large common barberry bush stood on a lawn before a village home. In 1940, the bush had been removed and stem rust was absent on the grain growing 40 paces from the former location of the bush. Near Salisbury, where stem rust was severe in 1937 near barberries, mostly escaped in a pasture, the bushes were destroyed in the early summer of 1938 with a few sprouts surviving and only a light rust infection had developed. In 1940, no sprouts were found in this pasture area and no stem rust was present. At other known barberry sites no grain was growing near the bushes with few exceptions and then the crop was sown so late its immature state had permitted little or no rust development. New locations for barberry in 1940 were Dorchester, Salisbury, Milltown, Fredericton and Rothesay Collegiate Institute, Rothesay. (S. F. Clarkson)

Stem rust was not observed in the few fields examined in N.S., however, in the plots at Glenholme, up to 65% of rust occurred on susceptible varieties, while an occasional pustule was present on Vanguard. Old aecia were abundant on a barberry hedge at Boylestown and on several bushes at Glenholme on Aug. 16. (J. F. Hockey) Stem rust did not appear until late in the season in P.E.I. and most of the infections were light.

SPECKLED LEAF BLOTCH (Septoria Avenae) caused a slight to moderate infection in 5 fields in Alta. and in the Edmonton plots. It affected 0.83% of the leaf area in 136 fields in Que., while 3.99% was affected in the 13 varietal tests (I. H. Crowell and D. Leblond). With leaf blotch (H. Avenae), the situation was just the reverse (see p.12) not only in Que. but apparently also in N.B. It is just possible that the rust resistant varieties are more susceptible to Septoria. Oat leaves from the 1939 crop affected by typical S. Avenae were received from W. Jones, who reported it quite common almost everywhere in B.C.
(I. L. Conners)

SMUT (Loose Smut, Ustilago Avenae and Covered Smut, U. Kolleri). Infection ranged from a trace to 5%, average 2%, in the 17 affected fields in Alta.

Covered smut affected 14 out or 23 farmers' fields in Sask.; at Rosetown, where the seed was not treated 25% of the heads were smutty. Loose smut was found in 3 fields. In 37 plots of elite and foundation seed, of which 29 were of Vanguard, 12 were affected by both smuts, 8 by covered smut, and 2 by loose smut. In three plots, where the seed had not been treated 2-5% of covered smut was present. Where the seed had been treated carefully (mostly by hand) with Ceresan, the stands were nearly smut-free.

Smut was recorded in 24 fields in Man.; infection ranged from a trace to 20% and averaged 5% in these fields. In a field of Swedish Star in Lincoln Co., Ont., smut infection was: Covered smut 25%, loose smut 10%. Smut was common everywhere in Que. Smut was recorded in 80 fields out of 120 examined in N.B., the average infection of covered smut being 3.0% and loose smut 1.0% or 4.0% for the two smuts. The

highest infection observed was 35%; covered smut 15%, loose smut 20%, in a field at Green Point (S. F. Clarkson). The average infection in the few fields of oats examined in N.S. was 6%; both smuts were about equally abundant (J. F. Hockey). Infection ranged from a trace to 3% in fields examined near Charlottetown, P.E.I. Four seed treaters were loaned to farmers this year; marked success was obtained in controlling smut. (R. R. Hurst)

BLAST (non-parasitic) was recorded as follows: Present in all fields in Alta. - trace in 29 fields, 5% in 25, 10% in 9, and 15-25% in 3, trace to 20% in plots at Lacombe; present in every field in Sask., damage ranging from a trace to moderate; varied greatly in intensity being especially prevalent in some localities in Que., absent to slight in others, up to 90% of spikelets blasted in some heads; present in all fields in N.B., 10-25% of blast common; amount of blast varied widely in different test plots in N.S.; slight to moderate amounts recorded in the plots in P.E.I.

BRONZE LEAF (non-parasitic). A bronze or purple leaf discoloration was widespread throughout N.S., particularly in fields seeded early. It was present in the fertilizer plots at Nappan, irrespective of fertilizer applied. The affected plants showed more blast than normal plants. (J. F. Hockey)

GLUME DISCOLORATION (non-parasitic). A trace was present in Victory and 1042-121 in the test plots at Currieburg, N.B.; apparently it is due to an accumulation of anthrocyanin pigment. (S. F. Clarkson and T. Johnson)

GREY SPECK (manganese deficiency) was marked on Erban and Vanguard in the plots at Chambord, Que., on Aug. 19, while the other varieties showed no symptoms. This is the first report of the trouble in the Lake St. John region. A species of Heterosporium was fruiting on the lesions. (I. H. Crowell)

BARLEY

SMUDGE (Alternaria sp.). Discoloured kernels in a 1939 seed sample from the Seed Laboratory, Saskatoon, Sask., yielded Alternaria sp.

ERGOT (Claviceps purpurea). A moderate infection occurred in Peatland and a trace in several other varieties at Lacombe, Alta.; 10% of the heads were affected in a plot at Edmonton. A trace of ergot was seen in the plots at Muenster, Sask.

Several samples of Nobarb barley grown in Ont. and sent for examination contained a high percentage of ergots; this variety appears to be decidedly susceptible to the disease. (J. E. Howitt)

POWDERY MILDEW (Erysiphe graminis) was reported as follows: General on all varieties at Sidney, B.C., while a slight infection was

present in the plots at Agassiz (W. Jones); a slight to moderate infection on a few varieties at Edmonton, Alta.; common and generally distributed in Que.; only traces in the plots at Fredericton, N.B.; a moderate infection in a field in Queens Co., P.E.I.

ROOT ROT (Fusarium sp.) was reported as causing heavy damage at Dunblane, Sask., on Rex barley. This, I believe, is unusual for this variety. (T. C. Vanterpool)

STRIPE (Helminthosporium gramineum) was observed in 18 out of 47 fields in Alta., infection being a trace in 4 fields, slight in 10, moderate in 2 and severe in 3, the latter east of Edmonton. Infection was a trace to moderate in the plots at Edmonton and Lacombe. A trace was found at Regina and Saskatoon, Sask., and slight infection at Beechy. A trace was present in Odessa barley in an experiment on seed longevity at Saskatoon. The seed came from a 1925 sample. It would appear that the fungus persisted in or on the seed for 15 years. The seed germinated 75%. (T. C. Vanterpool)

SPOT BLOTCH (Helminthosporium sativum) was reported as follows: A trace on Sanalta and Olli at Agassiz, B.C.; a trace in 7 fields and slight in 8 in Alta., a trace to moderate infection in plots at Edmonton and Lacombe; a trace to moderate infection in 10 fields in Man.; common and generally distributed in Que.

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.) was a trace in 8 fields, slight in 5, and moderate in 4 in Alta. It caused slight damage in 12 fields out of 18 examined in Sask.; basal lesions are common which frequently so completely rotted the base of the stems as to cause the plants to fall over. The disease was severe in patches at Newdale, Man.; and a light scattered infection occurred at Graysville.

NET BLOTCH (Helminthosporium teres) was reported as follows: Much less prevalent than usual in Alta., only traces found in 4 fields; 25% infection at Rapid City and Woodside, Man., slight at Neepawa and a trace at Jordan; common and generally distributed in Que.; slight in N.B. although a 30% infection at Port Elgin; a trace at Rustico, P.E.I. Perithecia (Pyrenophora teres) were collected on May 16 at Macdonald College, Que., and matured in a moist chamber (M.C. 566). (I. H. Crowell)

BACTERIAL BLIGHT (Phytomonas translucens) caused a slight infection in 2 fields near Edmonton, Alta., and a trace to slight infection on some varieties at Lacombe. The disease was found in 4 out of 36 fields examined in Man., infection moderate at Brandon, slight at Russell, patchy, trace to moderate at Winnipeg and a trace in patches at Morris. (W. A. F. Hagborg)

LEAF RUST (Puccinia anomala) was recorded in B.C.: Slight on Regal at Agassiz and traces on several varieties at Sidney; Sask.: Slight infection at Alameda out of 18 fields examined; Que.: Common and generally distributed; N.B.: Generally very light, but 65% infection in a field at Dorchester; N.S.: Trace to 5% infection in plots at Nappan; P.E.I.: A trace to 1% in the varieties at Palmer, a trace to 5% at Charlottetown.

STEM RUST (Puccinia graminis) was not observed on barley in Alta. until Aug. 20, when traces were found in 3 fields in central Alta. Infections of 10% or less were found in only 3 out of 18 fields surveyed in Sask. in July and early August, but stem rust was common and quite heavy on late crops or in heavy stands. Stem rust was, in general, light on barley and no appreciable damage occurred in Man. However, in some late fields in southern Man., infection averaged as high as 35% and some damage probably occurred in these fields (B. Peturson). Stem rust was common and generally distributed in Que., wherever barley was grown (I. H. Crowell). Stem rust was only observed in the plots at Fredericton, N.B., infection being a trace to 1%. Only a trace was found in P.E.I.

SCALD (Rhynchosporium Secalis) was very severe on Gatami, but no infection was present on Cape, Flynn, Lansdale, Plush, Trebi and Zero in the plots at Sidney, B.C. in April (W. Jones). A trace to slight infection was present in 3 fields, moderate in 5 and severe in 3 out of 47 examined in Alta., infection was general in the plots at Edmonton, Lacombe, and Olds and ranged from a trace to moderate on different varieties. Scald was severe on several common barley varieties, such as O.A.C. 21 and Regal, in the plots at Saskatoon, Sask.

SPECKLED LEAF BLOTCH (Septoria Passerinii). Infection ranged from a trace to moderate in the plots at Edmonton, Alta.

COVERED SMUT (Ustilago Hordei) was present in 15 out of 47 fields examined in Alta., the average infection being 1.0%, and the highest 20% at Blackfalds. Infection varied from a trace to 2% in 6 out of 18 fields examined in southern Sask. Covered smut was recorded in 4 fields in Man., the highest infection being 8% at Hayfield. It was common everywhere in Que. In the 9 fields examined in N.B., average infection was 1%.

LOOSE SMUT (Ustilago nuda) was recorded as follows: Slight on Newal at Sidney, B.C., slight at Armstrong; 5% infection at Perryvale, Alta.; in 4 fields out of 18 examined in Sask., the highest infection being 4% at Beechy; infection a trace to 13%, average 3.1%, in 16 affected fields in Man.; common everywhere in Que.; in 9 fields examined in N.B., average infection 1.5%, the highest 10% at Port Elgin; infection a trace to 10% in N.S.

FALSE STRIPE (cause unknown) was light, but general at Brandon, Man.

STERILITY (cause unknown). Numerous florets were blasted in

the heads of Chevron at Sidney, B.C., but other varieties were not affected. (W. Jones)

RYE

ERGOT (Claviceps purpurea). A slight infection was found in the plots at Olds, Alta., and in a field near Calgary. A trace of ergot was reported from Winkler, Man., and in the plots at Fredericton, N.B.

POWDERY MILDEW (Erysiphe graminis). A trace was observed at Avonport, N.S. (K. A. Harrison)

BACTERIAL BLIGHT (Phytomonas translucens var. secalis) was noticeable in the University plots, Saskatoon, Sask.; infection was little more than a trace. The disease appears to be more prevalent on rye than on wheat or barley in these plots in most years. (T. C. Vanterpool)

LEAF RUST (Puccinia secalina). A 5% infection was observed at Avonport, N.S.

II. DISEASES OF FORAGE AND FIBRE CROPS

ALFALFA

BLACK STEM (Ascochyta imperfecta). Of 18 fields examined in Alta., a trace was found in 4 fields, slight infection in 4 and moderate in 3; leaf infection also was moderate in the 3 latter fields and was severe on several plants in the plots at Edmonton (M. W. Cormack). A specimen was received from White Fox, Sask., Ascochyta, believed to be A. imperfecta was present on the leaf stipules (R. C. Russell). A. imperfecta was fairly common on the leaves causing the basal ones to drop at Macdonald College, Que. (M.C. 580). This appears to be the first report for Que. (I. H. Crowell)

ROOT ROT (Cylindrocarpon Ehrenbergi, etc.) caused a trace to slight damage in 13 fields out of 20 examined in central and northern Alta. in May. Although root rot was associated with bacterial wilt in southern Alta., the former was believed to have been the cause of moderate damage in 5 fields in the Brooks district, and of severe injury in 1 at Magrath out of 200 examined in June. (M. W. Cormack)

Fusarium Scirpi var. acuminatum was associated with a root rot in the Selkirk area, Man. (W. L. Gordon)

STAGONOSPORA LEAF SPOT (Leptosphaeria pratensis (Stagonospora Meliloti). A trace was found on alfalfa at Edmonton and Wetaskiwin, Alta. The symptoms were very similar to those commonly observed on sweet clover and the fungus was isolated from both collections. It has not been previously reported on alfalfa in Alta. (M. W. Cormack)

DOWNY MILDEW (Peronospora aestivalis) was a trace on Ladak and Grant and slight on Lytton at Agassiz, B.C. in June (W. Jones). A slight infection was found in one field near Millet, Alta. The disease has been rare in the experimental plots in Alta., since the extremely susceptible variety, Lytton, was discarded. (M. W. Cormack)

BACTERIAL WILT (Phytomonas insidiosa) was severe in all fields of Grimm alfalfa on the Experimental Station, Summerland, B.C. Old fields were dying out rapidly and one field sown in the spring was killed out completely in September. No disease was found in new stands of Ladak. Experiments were completed that established the identity of the pathogen. (G. E. Wooliams.)

A special survey made in early June showed that bacterial wilt is already widespread in the irrigated sections of southern Alta. The estimated mortality occurring this year in fields examined in four separate irrigation districts is given in Table 2.

Table 2. Estimated percentage of alfalfa plants dying from bacterial wilt in fields 3 years old and older in June, 1940.

Damage in 1940	Number of fields examined			
	Brooks	Vauxhall	Lethbridge	Glenwoodville
None	0	0	0	7
Trace	27	6	27	4
1-2%	19	1	11	2
5%	9	2	17	1
10%	8	3	4	0
15-30%	4	0	0	0
Total fields	67	12	59	14
Average damage	4%	4%	3%	1%

The least damage was found in the small irrigation district at Glenwoodville, where several 3- and 4-year-old stands were apparently uninfected and damage occurred only in older stands. In the other districts, plants were dying in all fields examined that were 3 years old or older. The early stages of infection were found in many fields less than 3 years old, particularly in the Brooks district. Here, most of the killing this year occurred in relatively young stands since most of the older stands, including those in which severe injury was found in 1939, have been ploughed up. In the Lethbridge district, however, the older stands predominate and the actual killing observed in 1940 was less than at Brooks. This would appear to indicate that the disease was introduced more recently or is progressing less rapidly at Lethbridge than at Brooks. Bacterial wilt was found for the first time at the Experimental Station, Lethbridge, but not more than a trace of plants in stands 5 or more years old were affected.

Bacterial wilt was not found in alfalfa growing on dry land, even in fields adjacent to those irrigated. (M. W. Cormack)

CROWN GALL (Phytomonas tumefaciens). A few plants showing symptoms resembling crown gall were found in an irrigated plot of 2-year-old alfalfa at Lethbridge, Alta. Bacteria were abundant in the proliferated crown tissue and the type appearing most abundantly in the isolations closely resembled P. tumefaciens. (M. W. Cormack)

YELLOW LEAF BLOTCH (Pseudopeziza Jonesii). A slight infection was found in 4 fields out of 18 examined in early July in Alta. New growth became moderately infected in the plots at Edmonton in early June and again in September. (M. W. Cormack)

COMMON LEAF SPOT (Pseudopeziza Medicaginis) infection was slight in 3 fields, moderate in 2 and severe in 1 at Brooks in Alta.; it was general but usually slight in the plots at Edmonton and Lacombe. Severe defoliation occurred in registered fields across northern Sask. The lower leaves were heavily infected in June at Macdonald College, Que., although the spring was dry. The disease was also recorded in B.C., Man., and P.E.I.

LEAF SPOT (Stemphylium botryosum) was more prevalent than that caused by Pseudopeziza Medicaginis in several fields about Agassiz, B.C. It was also found at Milner. Spots numerous, circular to elongate, up to 2.5 mm. long by 1.0 mm. broad, light brown, papery with purplish margins (W. Jones). It is suspected that this disease is the same as the brown leaf spot described by L. R. Tehon and E. Daniels, Phytopathology 15:714-19. 1925, but as S. P. Wiltshire (Trans. Brit. Myc. Soc. 21:224-228. 1938) has shown, they incorrectly determined the pathogen on alfalfa. According to the recent work of Oliver F. Smith (Jour. Agr. Res. 16:831-840) the pathogen is Stemphylium botryosum. (I. L. Conners)

WITCHES' BROOM (virus?). About 1% of the plants were moderately to severely affected and many others were beginning to show the symptoms in a plot at Edmonton, Alta. (M. W. Cormack)

YELLOWS (boron deficiency) was quite general and damage was thought to be considerable in Queens Co., P.E.I.

YELLOWS (non-parasitic) was slight to moderate in 3 irrigated fields in southern Alta.; the cause is unknown. (M. W. Cormack)

WHITE SPOT (non-parasitic). Moderate spotting of the leaves was found in 2 irrigated fields in southern Alta. (M. W. Cormack). A single plant was seen at Macdonald College, Que. (I. H. Crowell)

WINTER INJURY. Alfalfa and clover were almost completely destroyed along the north shore of P.E.I. by the winter weather. (R. R. Hurst)

COMMON CLOVER

CERCOSPORA LEAF SPOT (C. zebrina) was common on alsike clover at Macdonald College, Que., on June 17.

SOOTY BLOTCH (Cymadothea Trifolii) was reported as follows: Infection general on red clover on Vancouver Island and in the Fraser Valley, B.C.; abundant infection on red clover at Lennoxville, Que., in some fields almost every leaf being affected, yet the plants apparently were not appreciably injured (D. B. O. Savile); general and very abundant on red clover in the oat growing region of Que., especially on plants in fields of cereals, but less common on those in ditches, roadsides and pastures. (I. H. Crowell)

POWDERY MILDEW (Erysiphe graminis) was general but infection variable in the Okanagan Valley, B.C. Infection was slight in 2 fields west of Edmonton, Alta., and moderate in the plots at Olds. Up to 100% of the leaf surface was covered at Macdonald College, Que., but infection variable.

ANTHRACNOSE (Kabatiella caulivora). A severe infection was found on red clover in a field near Fallis, Alta. (A. W. Henry)

STAGONOSPORA LEAF SPOT (Leptosphaeria pratensis (Stagonospora Meliloti). A slight to moderate infection was found on alsike clover at 2 locations near Edmonton, Alta. (M. W. Cormack)

COMMON LEAF SPOT (Pseudopeziza Trifolii) was rare on red clover at Macdonald College, Que. on May 31, and moderate at Yarmouth, N.S. on Sept. 7.

SCLEROTINIA ROT (S. Trifoliorum). A small number of red clover plants were affected on June 5, at Macdonald College, Que.; sclerotia were abundant in 1938, and several were found by this date in 1940, but intensive research failed to reveal any in 1939. (I. H. Crowell)

STEMPHYLIUM LEAF SPOT (S. sarcinaeforme). A few infected leaves were found at Macdonald College, Que., on June 17. (I. H. Crowell)

RUST (Uromyces Trifolii) was slight on red clover at Agassiz, B.C. and moderate at Lennoxville, Que.; it was also collected on white clover at Berwick, N.S.

MOSAIC (Pisum virus 2). Three affected plants of alsike clover were noted in York Co., N.B. (D. J. MacLeod)

YELLOWS (virus). A moderate outbreak was observed on white clover in one field in Queens Co., P.E.I.

GENETIC CHIMERA. Several specimens of red and alsike clover were seen at Macdonald College, Que., where a whole leaf, one side or sectors of the leaf were almost white, while the other parts or leaves were the normal green; usually several or all leaves on a plant were affected, but in varying degrees. (I. H. Crowell)

SWEET CLOVER

STEM CANKER (Ascochyta caulicola) was slight in 3 fields and moderate in 1, out of 19 examined in Alta. (M. W. Cormack)

BLACK STEM (Ascochyta lethalis). A moderate infection was observed in 2 fields in Alta., and, late in the season, in the plots at

Lacombe. Single spore isolates obtained from this material were distinct from those obtained from stem canker. (M. W. Cormack)

ROOT ROT (Fusarium spp., etc.). The damage from root rot was about 5% in 2 fields near Lethbridge, Alta., in May. Moderate infection was also found in some of the check plots at Edmonton and Fallis. Moderate root rot damage was caused by Fusarium culmorum in a plot at Lacombe in August. (M. W. Cormack)

STAGONOSPORA LEAF SPOT and STEM BLIGHT (Leptosphaeria pratensis (Stagonospora Meliloti). Leaf spot was a trace in 7 fields and slight in 8 others in Alta. as well as in the plots at Lacombe and Lethbridge. Stem blight was slight to moderate in 4 fields. Mature perithecia of the perfect stage, Leptosphaeria pratensis, were found for the first time in Alta., when they were collected on overwintered stems in the southern part of the province. (M. W. Cormack)

PHYTOPHTHORA ROOT ROT (P. Cactorum), which was first reported from Alta. last year (Phytopath. 30:700-701. 1940 and P.D.S. 19:27-28) appears to be generally distributed in the southern part of the province. The damage was estimated to be a trace to slight in 8 fields, 5% in 2, and 10% in 1 out of 17 examined; a moderate infection was also found at Fallis, west of Edmonton. (M. W. Cormack)

WITCHES' BROOM (virus?). One plant was found severely affected in the plots at Edmonton, Alta. (M. W. Cormack)

MOSAIC (virus). A single plant was seen in a plot at the University, Saskatoon, Sask. Leaves were mottled and distorted; the plant was dwarfed, and much branched.

LUPIN

ROOT ROT (Pythium sp.). About 10% of the plants were killed in a plot of sweet blue lupin (Lupinus angustifolius) at Edmonton, Alta., in August. Yellow lupin (L. luteus) in an adjacent plot was unaffected. A species of Pythium resembling P. de Baryanum was isolated and pathogenic to the blue lupin in field inoculation tests. Pathogenicity tests have not yet been made on the yellow lupin.

A similar root rot caused by Pythium spp. in Germany was also reported as most severe on blue lupin (Schulz, H. Phytopath. Zeitschr. 12:351-359. 1939) (M. W. Cormack)

BUCKWHEAT

A smut (Ustilago utriculosa) affected plants of Polygonum sp. (most probably P. lapathifolium according to H. Groh) in a field of buckwheat at Danville, Que. When the buckwheat was threshed it "caused a black cloud to come from the thresher". (I. L. Conners)

YELLOWS (virus). A trace of yellows was found in Queens Co., P.E.I. This is the first record from P.E.I. (R. R. Hurst)

CORN

STALK and EAR ROTS (Fusarium moniliforme, etc.). Seed corn suffered severe damage from ear rots in the seed corn belt in south-western Ontario. Open pollinated strains in general were more severely damaged than hybrid varieties. In one 55-acre field near Forest, infection was about 90%. The fungi responsible were Nigrospora sphaerica, Fusarium moniliforme, F. graminearum, and Diplodia Zeae. (L. W. Koch)

RUST (Puccinia Sorghi). A trace was observed in one field in Queens Co., P.E.I.

WILT (Pythium arrhenomanes). Several fields of corn were affected in the Red River Valley, Man. The disease occurred in patches. The casual organism was identified by T. C. Vanterpool. (J. E. Machacek)

SMUT (Ustilago Zeae) was reported as follows: Light infection at Melville and Saskatoon, Sask.; slight infection at L'Assomption, Que.; one specimen from Queens Co., P.E.I.

FLAX

WILT (Fusarium spp.) was reported from Osborne (F. oxysporum forma associated) and Petersfield, Man. (F. Scirpi var. acuminatum and Helminthosporium sativum) (W. L. Gordon). A slight infection was reported in one field at Ste. Anne de la Pocatiere, Que. (L. J. S. Laporte)

RUST (Melampsora Lini). Infection was severe in the plots at Lethbridge, Alta., and in several fields in the irrigated districts. Infection was a trace to moderate in the varieties at Olds and Lacombe and slight in a field at Camrose. Rust was conspicuous in the University plots, Saskatoon, Sask. Infection was slight on Bison, trace to slight on Redwing and a trace on Royal. It was also common on the wild flax, Linum Lewisii (T. C. Vanterpool). A moderate infection on Royal was seen at Lacross and rusted samples were received from Saskatoon and Elrose districts. Rust infection varied from a trace (usually) to 30% in 11 affected fields in Man.

BROWNING (Polyspora Lini). A severe infection was found in the plots at Fallis, Alta., on July 12 (A. W. Henry). It affected 1% of the Bison plants in the University plots, Saskatoon, Sask. The chief symptom was a stem break about 1½ inches above the ground level (T. C. Vanterpool). It caused slight damage in a plot of Royal and one of fibre flax and a trace in 2 others of fibre flax at Scott. A trace was present on Bison

and Royal, but not on Redwing in field blocks of foundation stock at Saskatoon.

SEEDLING BLIGHT. Rhizoctonia Solani and Fusarium Scirpi var. acuminatum were associated with a seedling blight of flax at Brandon, Man. In isolations, the former organism was the more prevalent. (W. L. Gordon)

PASMO DISEASE (Septoria linicola). A trace was present on 60% of the plants at Brandon, Man.

HEAT CANKER (non-parasitic) caused slight injury at Cromer, Man.

FOXTAIL MILLET

SMUT (Ustilago Crameri Körn) was found in a seed sample of foxtail millet from Carnduff, Sask. Smut balls, which were noted in the sample by P. M. Simmonds, were composed of the ovaries, more or less completely destroyed by the smut. This is the first collection of the smut in Saskatchewan, although it is present in a seed sample of foxtail millet deposited in the herbarium from Delta, Ont., grown in 1935. Three other samples from Saskatchewan and found to be smutty were seed of broom-corn millet. In one from Howard, Sask., fragments of the smut boil of Sphacelotheca Panici-milacei (Pers.) Bubak (Sorosporium Panici-milacei Takah.) were present. This latter smut is not uncommon and is known from every province except N.S. Mr. A. W. Wright, Seed Inspection Division, Ottawa, kindly determined the seed samples. (I. L. Conners)

MANGEL

SCAB (Actinomyces scabies) caused slight damage in a small plot at Fredericton, N.B. (D. J. MacLeod)

LEAF SPOT (Cercospora beticola) was general and caused moderate damage at Agassiz, B.C. (W. Jones). A scattered infection was found in a crop being grown for stecklings at Armstrong, B.C.; the damage was negligible (R. E. Fitzpatrick). A heavy infection occurred at Standbridge East, Que., while light infections were observed elsewhere (E. Lavallee). In one field in Western Ontario, over 90% of the plants showed marked injury (J. E. Howitt). The disease was reported as heavy in a field in Prince Co., P.E.I. (R. R. Hurst)

MOSAIC (Beta virus 2). Two plants showing mosaic were found on a farm in York Co., N.B.; the mottle was very marked and the plants were dwarfed. (D. J. MacLeod)

FERN LEAF (virus). One affected plant was found in a plot at Fredericton, N.B. (D. J. MacLeod)

CRINKLE (virus). A trace of the crinkle disease described last year (P.D.S. 19:31) was found at the Station, Fredericton, N.B.; the vector was not established. (D. J. MacLeod)

ROOT ROT (cause undetermined). Roots planted for seed were moderately damaged by decay at Milner and Ladner, B.C. (W. Newton). A decay of the fibrous roots was general in a field at the Experimental Farm, Agassiz, and caused severe damage.

SORGHUM

SMUT (Sphaceolotheca Sorghi) was very common and destructive on amber sugar cane and broom corn at Macdonald College, Que.

SOY BEAN

LEAF SPOT (Phyllosticta ?phaseolina Sacc.) affected a few leaves at the Farm, Agassiz, B.C. Spots circular except along veins, 2-25 mm. in diam., light brown with darker brown margin; pycnidia few, dark brown, in central part of spot; spores biguttulate, hyaline, 7.0x1.8-2.0 u. (W. Jones)

BACTERIAL BLIGHT (Phytomonas glycinea) was general, but the infection was slight at Winnipeg, Man. It moderately infected Mandarin Brown, but very little was present on the other varieties at Lennoxville, Que. It is unknown whether this was due to differences in varietal susceptibility or to the use of infected Mandarin seed, and the rain was insufficient to cause extensive spread to other varieties. (D. B. O. Savile)

MOSAIC (virus). A trace was found at Winnipeg, Man.

SUGAR BEET

SCAB (Actinomyces scabies) caused slight damage to a small plot at Fredericton, N.B. (D. J. MacLeod)

LEAF SPOT (Cercospora beticola). All sugar beet fields were infected in Kent Co., Ont., but the damage varied widely. (L. W. Koch)

LEAF SPOT (Phoma Betae). A slight infection was present at the Station, Sidney, B.C.

LEAF SPOT (Ramularia beticola Fautry & Lambotte) was found for the first time in Canada in a field of Cercospora resistant beets, when it was collected by Dr. Irene Mounce at the Station, Sidney, B.C. The leaf spot was fairly abundant. This disease has been observed in the United

States, although it has never been reported according to Dr. John A. Stevenson, Washington, D.C. The spots were generally larger than those caused by Cercospora and the white conidiophores and conidia cause them also to be lighter in colour. The disease appears to be of minor importance although it occasionally causes some damage in Denmark. A brief account with a good illustration is given by A. Wenzel (Phytopath. Zeitschr. 3:519-532. 1931). In these two countries the pathogen has been called R. Betae Rostrup, but since the two names appear to be synonymous, the older one, R. beticola, has been adopted here. (I. L. Conners)

LEAF SPOT (Septoria Betae West.). A Septoria found on rather faded leaves in two plots of about an acre each at the Station, Sidney, B.C. was referred to this species, but the symptoms do not suggest a very active parasite. This is the first report of its occurrence in Canada. (I. L. Conners)

RUST (Uromyces Betae) was general in January on the foliage of beets grown for seed at the Station, Sidney, B.C., but it was considerably checked during the dry summer. In October it was again general and the leaves were being severely damaged. It would appear from experiments made by Dr. Margaret Newton at Winnipeg, that the beet rust requires a fairly low temperature for urodiniospore germination. (W. Jones)

SUNFLOWER

RUST (Puccinia Helianthi). A moderate infection occurred on the lower leaves at the University, Saskatoon, Sask. in July, and was severe on some varieties in late August. Rust infection was severe at Winnipeg and moderate at Brandon and Morden, Man.

WILT (Sclerotinia sclerotiorum). Infected plants were found at Edmonton, Alta. and at Morden, Man.

CULTIVATED GRASSES

AWNLESS BROME GRASS (Bromus inermis)

Ergot (Claviceps purpurea). A trace was found in one field out of 7 examined in Alta. A severe infection was found on a volunteer stand near Edmonton.

Anthracnose (Colletotrichum graminicola) was found to be common at Macdonald College, Que. (I. H. Crowell)

Leaf Blotch (Helminthosporium Bromi) was slight in one field and moderate in 3 in Alta.; a severe roadside infection was found near Edmonton.

Halo Blight (Phytomonas coronafaciens (C. Elliott) Bergey et al var. atropurpurea (Reddy & Godkin) Magrou) had almost killed out a brome and timothy pasture at Morris, Man., when it was found on June 6. The remaining plants were severely discoloured, purple or black. An oat field adjacent to the pasture was severely infected throughout and a four foot

strip, next to the pasture was killed. The remaining seedlings were heavily attacked by a bacterial disease. The organism isolated from the brome grass was pathogenic to oats as well as the brome, but cultures from the oats were not pathogenic to brome grass although they were to oats. The disease in oat fields was thus due to a mixed infection of which only one pathogen was recovered or else was caused by an organism distinct from that on the brome grass. The killed strip suggested that some of the disease in the oat field was due to the pathogen on the brome grass. (W. A. F. Hagborg) This is the first report of halo blight on brome grass in Man. What may be the same disease has been reported from Alta. (P.D.S. 11:30)

Scald (Rhynchosporium Secalis). A slight infection was found in one field in Alta.

Leaf Spot (Selenophoma bromigena (Sacc.) Sprague & Johnson) was slight in 2 fields and moderate in 2 others in Alta. R. Sprague and A. G. Johnson recently transferred Septoria bromigena Sacc. to the above genus (Mycologia 32:415. 1940).

KENTUCKY BLUE GRASS (Poa pratensis)

Anthracnose (Colletotrichum graminicola) was common as a leaf spot at Macdonald College, Que. (M.C. 572). (I. H. Crowell)

Smut (Ustilago striaeformis) was collected at Macdonald College, Que. (M.C. 610). (I. H. Crowell)

MEADOW FESCUE (Festuca pratensis)

Rust (Puccinia ?Poae-sudicatae) was severe on 01231, but no rust was seen on 01826 and 015 in the plots at Agassiz, B.C. (W. Jones)

ORCHARD GRASS (Dactylis glomerata)

Purple Leaf Spot (Mastigosporium rubricosum) was widely distributed on Vancouver Island and the Lower Mainland, B.C.; the damage was moderate. (W. Jones)

Brown Stripe (Scolecotrichum graminis) was general, but the damage was slight on Vancouver Island and the Lower Mainland, B.C.

PERENNIAL RYE GRASS (Lolium perenne)

Eye Spot (Ovularia Lolii) was general, but the damage was slight on Vancouver Island and in the Fraser Valley, B.C.

RED TOP (Agrostis alba)

Choke (Epichloe typhina) was abundant on a small patch of grass at Macdonald College, Que. (M.C. 611). (I. H. Crowell)

Shoot Blight (Fusarium Avenae) attacked individual clones in the test plots at Macdonald College, Que. in July. The culms were attacked about 16" from the ground causing the death of the distal portion. (I. H. Crowell)

Brown Stripe (Scoletotrichum graminis) was common in shaded places at Macdonald College, Que. (M.C. 601). (I. H. Crowell)

TIMOTHY (Phleum pratense)

Leaf Spot (Heterosporium Phlei) was severe on strain 0710 and a trace to moderate infection was present at Agassiz, B.C.; it was general on the Lower Mainland. Infection was moderate to severe in a plot at Edmonton and in a field at Flatbush, Alta. This leaf spot was quite abundant even on May 17 at Macdonald College, Que. A trace to heavy infection developed on several selections in the rust nursery at Charlottetown, P.E.I.

Stem Rust (Puccinia graminis var. phlei-pratensis) was severe on 01502 and slight to moderate on the other strains at Agassiz, B.C. It was reported as severe at Beaverlodge, Alta., and slight infection was observed in a field near Edmonton. Stem rust is abundant in Que. and it is obviously very destructive for it kills the stems when prevalent. (I. H. Crowell) It was very common on patches of the wild grass in P.E.I. and it was also present in the Nursery at Charlottetown.

Brown Stripe (Scoletotrichum graminis). A slight infection occurred at Agassiz, B.C.

Smut (Ustilago striaeformis) was found on a few plants in a pasture at Macdonald College, Que.

WESTERN RYE GRASS (Agropyron tenerum)

Ergot (Claviceps purpurea). A trace was found at Fort White, Man.

Smut (Ustilago bromivora). A moderate infection was observed at Strathmore, Alta., and in the plots at the University, Saskatoon, Sask.

GOLF GREENS

Dollar Spot (Rhizoctonia sp.) badly disfigured golf greens at several of the leading golf courses in Ont. in the summer season. It did not respond to the ordinary mercuric chloride treatment and became worse as the season advanced, so that some of the greens appeared ruined in the late fall. (J. E. Howitt)

MICHELS' HYBRID GRASS

Ergot (Claviceps purpurea). A slight infection was observed at Armstrong, B.C. (G. E. Woolliams)

III. DISEASES OF VEGETABLE AND FIELD CROPS

ASPARAGUS

Overwintered stalks of asparagus were found bearing sclerotia of Botrytis cinerea on their surface at Waterville, N.S. on April 30. (J. F. Hockey)

RUST (Puccinia Asparagi). A moderate general infection was observed in one field on Ile Bizard, Que., on Sept. 30. (E. Lavallee)

FASCIATION (non-parasitic). An occasional stem was affected at Morden, Man.

BEAN

ANTHRACNOSE (Colletotrichum Lindemuthianum). A slight infection was found at Gwynne, Alta. (A. W. Henry). The disease was generally slight to medium at Brandon, Man., but it was severe on Plentiful; infection was slight at Morden and a trace at Winnipeg.

Anthracnose and bacterial blight (q.v.) were very severe in the Montreal district, Que., on Brittle Wax and other varieties. In many fields, the crop was a complete loss. The severity of infection varied with the quality of the seed (E. Lavallee). The disease was common in York, Sunbury, and Queens Counties, N.B., but the damage was slight (D. D. Dolan). A moderate infection was seen at Beaver River, N.S., and severely diseased specimens were brought to the Laboratory at Charlottetown, P.E.I.

ROOT ROT (Fusarium spp.). A slight infection was found in one field out of 14 inspected in the Lethbridge district, Alta. (S. B. Clay). Fusarium Solani and F. Scirpi var. acuminatum were associated with a root rot of beans at Medora, Man. (W. L. Gordon)

HALO BLIGHT (Phytomonas medicaginis var. phaseolicola). A very light infection was found on the leaves and stems only this year at Vernon, B.C. Field diagnosis was confirmed by a microscopic examination (G. E. Woolliams). A slight infection was observed in late July in 4 fields in Alta., and in the varietal plots at Lethbridge; the disease increased greatly later in the season. Severe infections were seen at Edmonton, Olds, and Grande Prairie and a moderate outbreak at Beaverlodge.

In a large garden patch at London, Ont., there were several infection areas on July 11; the disease was spreading quite rapidly and may have caused severe damage to the whole planting. It was also heavy in a field at Weston. (J. K. Richardson)

BACTERIAL BLIGHT (Phytomonas phaseoli). A trace to slight infection was found in 8 plantings mostly in the Lethbridge district, Alta., and in the plots at Lacombe. The disease was severe in many towns in [illegible]. Severe infections were seen at Henribourg and Melfort (H. W. Mead). In small test plots at Saskatoon, many plants of Dark Red Kidney were dead, over 75% of the leaf surface was destroyed on the remaining plants and bacteria were oozing from the few pods present, by early August; plots of other varieties showed varying amounts of leaf injury, the best being only very slightly infected. (T. C. Vanterpool)

Bacterial blight was in general severe at Brandon and Morden, Man.; it was also severe on Round Pod Kidney and other varieties, but the infection was very slight on Altoba and Rainy River. P. phaseoli only was isolated this year. (W. A. F. Hagborg)

As already reported above, bacterial blight was severe in the Montreal district, Que. Seven fields of Brittle Wax being grown for seed, were sown with seed from a field having traces of bacterial blight and anthracnose in 1939. Upon inspection, four showed only traces of disease, while in three bacterial blight infection was 2, 10, and 15% respectively. Another field sown with seed rigorously selected from healthy plants, the plants were absolutely free from disease in spite of a very unfavourable season. (E. Lavallee)

Bacterial blight was widespread in York and Westmoreland Counties, N.B.; it was more prevalent in hollows than on the tops of hills. (D. D. Dolan)

ROOT and STEM ROT (Rhizoctonia sp.). A slight infection was observed in 2 fields in the Lethbridge district, Alta.

DROP (Sclerotinia sclerotiorum) was severe in one patch in a planting of pole beans at Vernon, B.C. (H. H. Evans)

RUST (Uromyces appendiculatus) was general in a 2-acre field of Blue Lake on Lulu Island, B.C.; the damage was severe (W. Jones). A very severe infection affected a crop of Kentucky Wonder at Yarmouth, N.S. (J. F. Hockey)

MOSAIC (virus). A trace to 2% of the plants were affected in fields in the Okanagan Valley, B.C. (G. E. Woolliams). A trace to a small percentage of plants were affected in 4 fields out of 14 inspected about Lethbridge, Alta. (S. B. Clay)

MOSAIC (Phaseolus virus 1) was common on beans in York, Sunbury, Queens, and Westmoreland Counties, N.B. (D. J. MacLeod). A trace was found in scattered plantings and gardens in N.S. (J. F. Hockey)

BEET

SCAB (Actinomyces scabies) caused severe damage in a small plot at Fredericton, N.B. (D. J. MacLeod)

LEAF SPOT (Cercospora beticola) was general and caused slight damage on the Lower Mainland and Vancouver Island, B.C. A moderate infection was found at Killarney, Man., and a trace at Brandon. This leaf spot caused slight damage in York and Sunbury Counties, N.B., but it was not as prevalent as in 1939 (D. D. Dolan). Heavy infections were seen in the field or on submitted specimens in P.E.I. (R. R. Hurst)

DOWNY MILDEW (Peronospora Schachtii) was general on a row of garden beets at the Farm, Agassiz, B.C. in August; the damage was slight. (W. Jones)

LEAF SPOT (Phoma Betae) was very slight at Agassiz, B.C., in June (W. Jones). A slight infection of leaf spot and root rot was found in a field of steckling Detroit Dark Red at Armstrong; less than 1% of the plants were diseased. (R. Fitzpatrick)

RHIZOCTONIA (R. Solani). A trace was present in a garden at Charlottetown, P.E.I.

RUST (Uromyces Betae) was moderately heavy in a garden at Sidney, B.C.

ROOT ROT (cause unknown) was severe on garden beets being grown for seed at Milner, Matsqui, Agassiz, and Keating, B.C.; the stand was invariably poor. (W. Jones)

BROCCOLI

BLACK LEAF SPOT (Alternaria Brassicae) was slight on plants being grown for seed at Agassiz, B.C.

BROAD BEAN

LEAF SPOT (Botrytis cinerea). A few spots were seen in the plots at Agassiz, B.C.

MOSAIC (virus) affected 1% of the plants in a small plot at Sidney, B.C., and 20% in a field plot at Agassiz.

CABBAGE

BLACK LEG (Phoma lingam) was general and severe on Danish Baldhead being grown for seed and a trace occurred on Copenhagen Market at Keating, B.C. (W. Jones)

BLACK ROT (Phytomonas campestris) was present in almost all plantings of early cabbage and cauliflower in the Leamington district, Ont.; the damage was moderate. (L. W. Koch)

CLUB ROOT (Plasmodiophora Brassicae) was general and caused moderate to severe damage on truck farms about Victoria and Vancouver, B.C. (W. Jones). The disease was very destructive in many fields in Laval and Jacques Cartier Counties, Que.; it was also observed in Vercheres and Chambly Counties (E. Lavallee). Affected plants were seen in a store, Charlottetown, P.E.I.

FASCIATION (?genetic). On a few plants grown for seed at Keating, B.C., the stalks of the inflorescence were flattened with small tufted foliar growth along them. (W. Jones)

CARROT

SOFT ROT (Erwinia carotovora) caused moderate loss in a seed crop at Agassiz, B.C., in June (W. Jones). Severe cases of soft rot were reported in carrots in storage in the Montreal district, Que. (E. Lavallee)

LEAF BLIGHT (Macrosporium Carotae). A slight infection was observed in a seed crop at Agassiz, B.C. (W. Jones). Some leaves on most plants were affected at Grand Forks. (H. R. McLarty)

BACTERIAL BLIGHT (Phytomonas carotae). A light infection was observed at Grand Forks, B.C. (H. R. McLarty). Infection was slight on all varieties at Morden, Man., and general and moderate, being especially heavy on Chantenay, at Brandon.

VIOLET ROOT ROT (Rhizoctonia Crocorum) was found in a plot of carrots at Comox, B.C. in January, 1941, by E. R. Bewell. The disease was confined to one end of the plot. The land was new, the carrots being the second crop. (W. Jones)

YELLOWS (Callistephus virus 1). A moderate infection was found at Brandon, Man. Yellows was widespread on carrot in York, Sunbury, Queens, and Westmoreland Counties, N.B. Infection varied from 1-15% of the plants. In a field test for resistance none of 14 varieties showed any resistance. Yellows was found on several perennial weeds growing near carrot fields. These weeds serve as foci from which the virus is spread to carrots and other susceptible crops. Macrosteles divisus, the vector, was not as active as in 1938 and 1939. Dr. M. B. Linn (Cornell Univ. Agr. Exp. Sta. Bull. 742. 1940) has recently shown the importance of affected perennial weeds as a source of virus for cultivated crops. (D. J. MacLeod)

Yellows was found affecting 7 to 25% of the plants in plantings in Annapolis Co., N.S., while some fields showed up to 40% infection in Kings County. The disease is causing appreciable economic loss. Several plants of Polygonum Convolvulus in or adjacent to carrot fields were affected by yellows, while it was common on Leontodon autumnalis, Chrysanthemum leucantheum near carrot fields (J. F. Hockey). Yellows showed up in several gardens at Charlottetown, P.E.I.

CAULIFLOWER

BLACK LEAF SPOT (Alternaria Brassicae) was general on the leaves of Early Snowball, Danish Baldhead, and Early Export being grown for seed at Parksville and Victoria, B.C. (W. Jones)

SOFT ROT (Erwinia carotovora) caused moderate damage to a seed crop of Early Snowball at Victoria, B.C. Soft rot caused moderate damage to cabbage and cauliflower in Essex Co., Ont. In one field a 2% infection at harvest resulted in a loss of 70% of the cauliflower, when the heads were picked wet and stored in crates for several days. (L. W. Koch)

CLUB ROOT (Plasmodiophora Brassicae) was general and the damage was severe about Victoria and Vancouver, B.C. (W. Jones). Club root is a serious problem in Laval and Jacques Cartier Counties, Que., on both cauliflower and cabbage. Besides some heavily infested fields, there is scarcely a field which does not show some diseased plants.

WIRE STEM (Rhizoctonia Solani) was a very serious disease of seed beds in the Montreal district, Que. Frequently 25% or even 50% of the seedlings have to be discarded. Sterilization of soil by formalin gave promising results in control. (E. Lavallee)

MOSAIC (virus). A few plants of Early Snowball were affected in a seed crop at Victoria, B.C.

BROWN HEART (boron deficiency) affected about 10% of the cauliflower in a field in York Co., N.B. (D. D. Dolan)

CELERY

EARLY BLIGHT (Cercospora Apii) was general on July 30 in a 3-acre planting in Lincoln Co., Ont. The leaves were severely spotted, and some of the older ones were almost dead. While weekly applications of spray would reduce the loss, the crop had already received a serious set back (J. K. Richardson). A slight infection was observed in a bed in June at Abord à Plouffe, Que. (E. Lavallee)

DAMPING OFF (Pythium, etc.) caused serious damage to 2 lots of celery seedlings grown in hot beds in Laval Co., Que. (E. Lavallee)

LATE BLIGHT (Septoria Apii-graveolentis) was found on all crates of celery examined on the Vancouver market, which indicated that the disease was widely distributed on Vancouver Island and the Lower Mainland, B.C.; it caused moderate damage in a ½-acre field at Cloverdale, B.C. The disease was severe in a field at Kelowna according to Mr. Ben Hay, who collected material for examination. This is the first record of late blight in the Okanagan valley; it was probably introduced on the seed. (H. R. McLarty and G. E. Woolliams)

A moderate infection was observed at London, Ont., on July 10; this was a rather severe infection for the time of year, and it was not being well controlled, although the planting was being dusted regularly (J. K. Richardson). Late blight was less severe than for several years in the Montreal district, Que. However, slight to moderate infections occurred in some fields (E. Lavallee). Late blight (S. Apii)was observed in one field in York Co., N.B.

STEM CRACKING (boron deficiency). No special survey was made, but a few lots of celery showing cracked stem have been seen on the public market in Montreal, Que. (E. Lavallee). The disease was found to be prevalent in Levis Co., where the boron content of the soil is extremely low, the plants remain small and the heart is affected by a dry rot. (R. Lachance)

BLACK HEART (physiological). About 2% of the plants were affected in one field in York Co., N.B.

CHINESE CABBAGE

CLUB ROOT (Plasmodiophora Brassicae) caused 10-15% damage in Laval Co., Que., in the one observation made. (E. Lavallee)

CUCUMBER

LEAF BLIGHT (Alternaria cucumerina (Ell. & Ev.) Elliott) occurred in sufficient quantity to cause alarm at Ottawa, Ont., but it was checked by the dry weather in late summer (D. B. O. Savile). The disease was moderate in a garden at Charlottetown, P.E.I. (R. R. Hurst)

SCAB (Cladosporium cucumerinum) was noted on cucumbers on the Bonsecours market, Montreal, Que. (E. Lavallee). Scab was absent until late in the season in N.B., when young fruits were severely attacked while many of the mature fruits remained free from disease. In trials at Fredericton, Maine #2 and West Indian Ghurkin were resistant of 29 varieties tested; Maine #2 has also many desirable commercial qualities. (D. D. Dolan)

ANTHRACNOSE (Colletotrichum lagenarium). Numerous crops under glass were damaged in Essex Co., Ont., in April and May; the disease was localized in some greenhouses, while in others it was general. The actual damage varied widely. (L. W. Koch)

BACTERIAL WILT (Erwinia tracheiphila). The damage was severe in the plots of the Horticulture Department of the University, Winnipeg, Man. (W. A. F. Hagborg). Infections were common in the Montreal district, Que., but the disease was not severe (E. Lavallee). Infection was moderate and damage considerable at L'Assomption, Que. Abundant infection, such as this, is to be expected near rivers, where Echinocystis lobata grows abundantly

supplying inoculum and ensuring a large number of beetles. (D. B. O. Savile)

FOOT ROT. Fusarium Scirpi var. acuminatum and F. oxysporum forma were associated with a foot rot and wilt at Homewood, Man. (W. L. Gordon)

ANGULAR LEAF SPOT (Phytomonas angulata) was not as prevalent in York and Kings Counties, N.B., as in 1939; the damage was slight. (D. D. Dolan)

COTTONY LEAK (Pythium sp.) was found in a fruit growing in the Station garden, Summerland, B.C. (M. F. Welch)

STEM and FRUIT ROT (Sclerotinia sclerotiorum). A severe infection was seen in a greenhouse at London, Ont. Numerous lesions were present on the vines and fruit and about 15% of the vines were killed. (J. K. Richardson)

MOSAIC (virus). A ¼ acre plot in Lincoln Co., Ont., was so severely infected that the fruit were all distorted and unsaleable (J. K. Richardson). A few affected plants were seen at Bordeaux, Que. (E. Lavallee). A trace (2 plants) was infected in a garden in Sunbury Co., N.B. (D. J. MacLeod).

EGG PLANT

EARLY BLIGHT (Alternaria Solani) was observed at Charlottetown, P.E.I., and FRUIT ROT (Phomopsis vexans) at Macdonald College, Que.

GARDEN CRESS

ROOT ROT (Rhizoctonia Solani) was causing considerable damage in a greenhouse in London, Ont. on Dec. 3, 1939. The soil was probably improperly sterilized. (J. K. Richardson)

HOP

DOWNY MILDEW (Pseudoperonospora Humuli). A severe infection occurred early in the season in the hop yards at Sardis, Agassiz, and Sumas, B.C. on Clusters and Golding. All symptom phases were present, viz. basal spike (shoot) leaf, lateral and terminal growth. The disease was checked owing to dry weather later in the season and the efficient application of spray; the cones escaped infection. (W. Jones)

CHLOROSIS (virus) was more general than usual in the hop areas

in B.C. and the symptoms were more pronounced in Fuggles. A slight infection was also present in Golding. (W. Jones)

JERUSALEM ARTICHOKE

RUST (Puccinia Helianthi) was general and the infection moderate at Waterville, N.S. (J. F. Hockey)

KALE

DOWNY MILDEW (Peronospora parasitica) was general, but the damage was slight at the Station, Sidney, B.C.

LETTUCE

ROT (bacterial) affected about 2% of the plants of New York 88 in a seed crop at Streetsville, Ont. The infection spread from the leaf margins into the head, finally rotting the hearts (J. K. Richardson). A soft rot caused slight damage to head lettuce in two gardens at Saskatoon, Sask. (T. C. Vanterpool)

DOWNY MILDEW (Bremia Lactucae) was severe causing much damage to the seed crop at Parksville, Victoria, and Agassiz, B.C. The disease was general on most of the outer leaves at Streetsville, Ont.; the loss was not severe as the crop was being grown for seed (J. K. Richardson). Downy mildew was general and stunted the growth, causing a 20% loss in a greenhouse at Dartmouth, N.S.

RUST (Puccinia patruelis) was very common on cultivated lettuce at Clearwater Bay, Lake of the Woods, Ont.

DROP (Sclerotinia sclerotiorum) affected less than 1.0% of the heads in a planting in the Grand Forks district, B.C. Infection was slight to moderate in several gardens at Edmonton and in a varietal test at Olds; it was moderate to severe in a test at Lacombe. Drop affected about 10% of the plants being grown for seed in the Horticulture plots, Experimental Farm, Ottawa, Ont.; about 1% were also affected by soft rot (Erwinia carotovora). Severe damage was reported in a greenhouse crop at London, Ont.; about 0.5% of the plants were affected in a seed crop at Streetsville.

BIG VEIN (virus). About 40% of the plants were affected in a field at Burlington, Ont. This is, as far as I am aware, a new virus disease for Ontario. Little is known except that it is of virus nature and may cause serious loss to the grower (J. E. Howitt). For a description of the disease see I. C. Jagger and N. Chandler (Phytopath. 24:1253-1256. 1934).

LIMA BEAN

LEAF SPOT (Phytomonas viridifaciens) was general but light in a test row at Vineland, Ont. (J. K. Richardson)

MELON

LEAF SPOT (Cladosporium cucumerinum) reached epidemic proportions in the Leamington district, Ont., as in former years, two weeks after harvesting began, and caused severe damage. Rain was frequent and spray material was quickly washed off. (L. W. Koch)

BACTERIAL WILT (Erwinia tracheiphila) caused severe damage in the Horticulture plots, at the University, Winnipeg, Man. Slight infections occurred in Essex Co., Ont.

LEAF SPOT (Septoria Cucurbitacearum) was moderate on young plants in the field on June 17 at Ottawa, Ont.; no disease was noted when they were set out. (H. N. Racicot and D. B. O. Savile)

MUSHROOM

BUBBLES (Mycogone perniciosa) was general in a bed of mushrooms at Mimico, Ont.; the crop was a loss. (G. C. Chamberlain)

ONION

NECK ROT (Botrytis Allii) was very slight on onions in storage in December, 1940, in the Okanagan Valley, B.C. (G. E. Woolliams). Neck rot and soft rot (q.v.) caused considerable loss in Sweet Spanish and other types in Essex Co., Ont., particularly in the Leamington marsh. (L. W. Koch)

SOFT ROT (Erwinia carotovora) was particularly destructive to Sweet Spanish onions in Essex Co., Ont. In all crops examined, excepting one, soft rot was present and usually neck rot also at the time of harvesting. In one field, the loss was 50-100 bu. in 8 acres of crop. (L. W. Koch)

FUSARIUM BULB-ROT (F. oxysporum) is present in most fields about Vernon, Kelowna, and intermediate points, B.C.; infection may be as much as 25% or more, while the average loss is about 5%. (G. E. Woolliams)

LEAF BLIGHT (Mycosphaerella allicina (Fr.) Migula) occurred on the older leaves of onions in a planting at Weston, Ont. The perithecia were abundant on the infected leaves and were at times also present on downy mildew lesions. It was also noticed in other districts (J. K.

Richardson). The organism was tentatively identified as Mycosphaerella allicina (Sphaerella allicina Auersw.). (I. L. Conners).

DOWNY MILDEW (Peronospora Schleideniana) was general and caused slight damage on the Lower Mainland and Vancouver Island, B.C. (W. Jones). It was observed in several fields through Ont.; in some patches 40% of the tops were destroyed quite early in the season. (J. E. Howitt). Downy mildew moderately infected a seed crop in St. Jean Co., Que. (E. Lavallee)

BLACK LEAF SPOT (Stemphyllium botryosum) was general and severe on a few rows of onions being grown for seed at Cobble Hill, B.C. (W. Jones). A trace was observed at Morden, Man. (J. E. Machacek).

PURPLE BLOTCH (Macrosporium Porri Ell.). A specimen of this leaf spot collected at Pictou, N.S., Aug. 27, 1931 was recently discovered in the Herbarium. The fungus agreed with the exsiccati Reliquae Farl. 180 and Ell. & Ev. Fungi Columb. 1229. The fungus is really an Alternaria (J. W. Groves and I. L. Conners).

PARSLEY

LEAF SPOT (Septoria Petroselini) was general in one garden at Sidney, B.C. (W. Jones).

PARSNIP

LEAF SPOT (Cercospora pastinacea) was abundant at Ste. Clothilde, Que. (J. G. Coulson and I. H. Crowell).

LEAF SPOT (Ramularia Pastinaceae) was general on crops grown for seed at Keating and in the Fraser Valley, B.C.; the damage was slight to moderate. (W. Jones).

YELLOWS (virus) about 1% of the plants in a garden in York Co., N.B., showed evidence of yellows (D. J. MacLeod). It affected less than 1% of the plants in a 4-acre field in Colchester Co., N.S. (J. F. Hockey).

PEA

LEAF and POD SPOT (Ascochyta Pisi). Infection was a trace to moderate in the varietal plots at Lacombe and Olds, Alta. A moderate infection was observed at Morden, Man. The disease was severe at East Farnham, Que., in 5 acres of Tall Telephone peas for use in the green pod towards the end of the cropping period. (E. Lavallee)

POWDERY MILDEW (Erysiphe Polygoni). Infection was slight to severe

in patches at Morden, Man. A heavy infection was observed on American Wonder in Queens Co., P.E.I.

ROOT ROT (Fusarium spp.). Infection was usually slight on peas at Lacombe, but it was severe on Laxton's Superbe. A light infection was found in a private garden in Saskatoon, Sask. F. oxysporum forma was associated with a root rot of peas at Elkhorn, Man. (W. L. Gordon).

ROOT ROT and BLIGHT (Fusarium spp. and Aphanomyces euteiches). Many complaints were received this summer that fields were being ruined in Ontario. Some fields were inspected in which fully 30% of the vines had been destroyed by this disease complex. In nearly all fields, where it was causing serious trouble, resistant varieties had not been sown. (J. E. Howitt).

DOWNY MILDEW (Peronospora Pisi) was widely distributed in both commercial and seed crops, but the damage was very slight in the Fraser Valley and on Vancouver Island, B.C. (W. Jones). A slight infection, mostly on the lower leaves, was seen at East Farnham, Que. (E. Lavallee).

LEAF SPOT (Septoria flagellifera). Traces were present in the gardens at the University, Winnipeg, Man. (W. L. Gordon). It was fairly conspicuous in a field at Douglas, Ont. This is the first report of S. flagellifera in Eastern Canada. (G. A. Scott and I. L. Conners)

LEAF BLOTCH (Septoria Pisi). Infection was a trace to slight on the varieties at Lacombe and Olds, Alta. The disease was quite common on field peas in the Ottawa Valley, Ont. (G. A. Scott). Leaf blotch was very heavy on Ryders Universal in a trial at Charlottetown, P.E.I.

ROOT GIRDLING (Rhizoctonia Solani). A slight infection occurred on World Record and Thos. Laxton at Winnipeg, Man.

RUST (Uromyces Fabae). A single pustule was found in the University garden, Winnipeg, Man. Rust was heavy in one crop of field peas near Ottawa, Ont. Traces were seen at St. Valerien, Ste. Martine and Oka, Que. (E. Lavallee). At L'Assomption rust was moderate to severe on varieties under test. (D. B. O. Savile)

MOSAIC (virus) was present at Keating and Sidney, B.C.

ROOT ROT (cause unknown) was general in a few seed crops at Keating, B.C.; the damage was slight.

PEPPER

CUCUMBER MOSAIC (virus) was quite severe in sweet and hot peppers in a planting in Lincoln Co., Ont. Although the infection was general and leaf mottling definite, some plants had normal fruit, while on

others the fruit were badly misshapen. (J. K. Richardson)

MOSAIC and STREAK (Solanum virus 1, strain L). A trace was found in a small garden in York Co., N.B. The identity of the virus was established (D. J. MacLeod)

MOSAIC (Solanum virus 2). A well defined veinal mottle was found on 3 plants in a garden in Fredericton, N.B. The virus was proved by inoculation on standard differentials. (D. J. MacLeod)

POTATO

Mr. L. S. McLaine, Chief of the Plant Protection Division, Production Service, has kindly supplied the tabulations on the extent of the seed potato industry, the acreages of the leading varieties passing inspection, the extent that fields failed to pass inspection, and the average percentage of the diseases - black leg, leaf roll, and mosaic - found in the fields. All fields entered for certification are planted with certified seed.

Table 3 - Seed Potato Certification: Number of Fields and Acres Inspected, 1940.

Province	Number of Fields		Fields Passed %	Number of Acres		Acres Passed %
	Entered	Passed		Entered	Passed	
P.E.I.	5,283	3,551	67.2	24,114	16,222	67.3
N.S.	641	514	80.2	1,494	1,245	83.3
N.B.	3,265	2,479	75.9	16,183	12,668	78.3
Que.	1,161	638	54.9	2,041	922	45.2
Ont.	1,124	783	69.7	2,435	1,735	71.3
Man.	115	98	85.2	194	150	77.3
Sask.	132	111	84.1	239	188	78.7
Alta.	186	157	84.4	243	192	79.0
B.C.	481	345	71.7	1,168	772	66.1
TOTAL	12,388	8,676	70.0	48,111	34,094	70.1

Acres Entered		Acres Passed	
1939	40,286	1939	31,545
1940	48,111	1940	34,094
Increase of 7,825 acres or 19.4%		Increase of 2,549 acres or 8.1%	

The acreage entered for certification surpassed for the third successive year the previous high of 1931, when 38,424 acres were entered. However, the acreage passing inspection only this year surpassed the previous high, also in 1931, when 32,592 acres passed field inspection due to higher percentage of the acreage failing to meet the requirements. There has been a steady increase in the acreage entered and passed since the low year of 1936 when 20,083 acres were entered and 16,739 passed. Mosaic, as usual, was the chief cause of rejection throughout Canada, especially in P.E.I. and Que.

Table 4 - Seed Potato Certification: Acreages Passed by Varieties, 1940.

Variety	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.-Alta.	B.C.	Total
Green Mountain	4,925	79	6,980	797	104	39	70	12,994
Irish Cobbler	10,785	263	576	87	271	112	6	12,100
Katahdin	398	458	3,500	26	766	4	63	5,215
Bliss Triumph	73	328	1,544			9	1	1,955
Netted Gem					8	204	544	756
Chippewa	24	4	43		344	10	1	426
Rural New Yorker					213			213
Early Ohio						67		67
Up-to-Date		56					9	65
Warba		1			27	26	7	61
Other Varieties	17	56	22	15	2	59	71	242
TOTAL	16,222	1,245	12,668	922	1,735	530	772	34,094

Nevertheless, the rejection for leaf roll noteably exceeded those for mosaic in N.B. and Ont. Bacterial ring rot accounted for the rejection of 264 fields in 1940 against 342 the previous year. The prompt rejection of all fields and bins showing the slightest trace of bacterial ring rot has definitely checked the disease for where the premises, machinery, bags, etc. have been carefully disinfected and new seed procured, the disease has not reappeared. Diseased seed, on the other hand, after most careful selection invariably gives a diseased crop, usually with enhanced losses.

Table 5 - Seed Potato Certification: Fields Rejected, 1940

Province	Mosaic	Leaf Roll	Black Leg	Bacterial Ring Rot	Foreign Varieties	Adjacent Diseased Fields	Misc.	Total
P.E.I.	1,050	88	20	16	69	190	299	1,732
N.S.	46	22	1		19	23	16	127
N.B.	206	323	6	121	61	47	22	786
Que.	207	26	39	111	12	105	23	523
Ont.	31	126	18	7	36	50	73	341
Man.			1	8		2	6	17
Sask.	2		6		2		11	21
Alta.	1	4	3	1	2	3	15	29
B.C.	41	17	3		2	24	49	136
TOTAL	1,584	606	97	264	203	444	514	3,712
Rejections as a percentage of fields:								
Entered	12.8	4.9	0.8	2.2	1.6	3.6	4.1	30.0%
Rejected	42.7	16.3	2.7	7.1	5.4	12.0	13.8	100%

Table 6 - Seed Potato Certification: Average Percentage of Disease Found in Fields, 1940.

Average percentage of disease found in	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
	%	%	%	%	%	%	%	%	%
Fields entered (first inspection)									
Black Leg	.07	.01	.06	.19	.09	.76	.26	.05	.08
Leaf Roll	.22	.57	1.05	.15	.58	.03	.03	.15	.37
Mosaic	1.21	1.09	.74	1.02	.31		.12	.18	.76
Fields passed (final inspection)									
Black Leg	.07	.01	.03	.07	.04	.42	.01	.02	.03
Leaf Roll	.17	.39	.18	.15	.18	.03	.01	.05	.09
Mosaic	.29	.38	.18	.25	.11			.03	.12

COMMON SCAB (Actinomyces scabies) was reported from across Canada. Scab was even present on most lots of Netted Gem in the Perryvale and Flatbush districts, Alta.; the surface of the tubers was not well netted, which may have permitted an unusual amount of infection. Scab is a problem in the certification of otherwise suitable seed in Sask., where in 23% of the fields that passed inspection, scab was present on 50% or more of the tubers harvested (J. W. Marritt). From Man. eastward the average infection was about 2.0% of the tubers. In Ont., scab was not serious, due probably to abundance of moisture and low soil temperatures. In a hot, dry growing-season over 40,000 bushels of potatoes otherwise suitable for certification have been rejected in Ont. on account of scab (O. W. Lachaine). Scab was of minor importance in N.B., except in 3 fields where lime had been applied in the past (C. H. Godwin). The same was true in N.S.; however, in one field of Netted Gem 90% of the tubers were affected (W. K. McCulloch). Scab was more prevalent in P.E.I. than in 1939; in a few fields all tubers were affected with deep scab (S. G. Peppin). For the first time, rotting has been found following heavy scab infection. (R. R. Hurst)

EARLY BLIGHT (Alternaria Solani) was found in northern Alta.; the damage was slight. A moderate infection was reported at Morden, Man. A slight infection was present in most fields in the Fort William area, Ont., except in one field, where it was severe in the lower part of the field, which, on account of its location was probably covered by fog for a number of hours for several days a week (J. W. Scannell). Early blight was observed in several districts in Que. from Montreal to Ragueneau (B. Baribeau). Slight infections were observed in Carleton and Victoria Counties, N.B. Early blight and drought reduced the yield of early varieties such as Bliss Triumph and Irish Cobbler about 25% in N.S., but the late varieties like Katahdin and Green Mountain were benefited by late rains and produced heavy crops. Little Alternaria rot was found. The disease caused slight to moderate damage in a few fields in P.E.I. One case of tuber rot was found in Irish Cobbler in October.

RHIZOCTONIA (Corticium Solani (Rhizoctonia Solani) caused only slight damage in fields entered for certification in Alta., and the development of sclerotia at bin inspection was small, averaging 5% slight to moderate. Rhizoctonia was present in most fields inspected in Man. but only to a slight degree. However, sclerotia were rather abundant in the tubers at bin inspection. Growers are advised to dig early to reduce the formation of the black scurf. This behaviour of the organism is particularly noticeable in the best potato growing areas in Rhineland, Stanley and Portage la Prairie municipalities.

Little rhizoctonia infection was seen in the field in Que.; average tuber infection was 2.5% in 403 bins inspected. Damping off due to rhizoctonia caused less misses in N.B. than in 1939 when it was prevalent. Infected plants were found in most fields, but the number was not large. Sclerotia were also less abundant on the tubers than in 1939. The potato area in York Co. was almost free from the disease. Rhizoctonia

was reported in 30% of the fields of Irish Cobbler and Bliss Triumph in N.S. and 50% of Katahdin, but the symptoms were milder than usual. It was first reported on July 15 and was fairly common by August 12. The average infection on the tubers was 3.5%, about the same as last year. Many crops were virtually clean, but heavy infections were numerous. One 100-acre field produced only 23 barrels of graded seed per acre instead of the normal yield of 60 to 80 barrels; the loss was largely due to rhizoctonia on the tubers (W. K. McCulloch). Rhizoctonia was less prevalent than usual in P.E.I., although much of the crop was harvested late.

TUBER ROT (Erwinia carotovora). Considerable damage was caused to stored potatoes at Winnipeg, Man., by a soft rot of the tubers during the fall of 1940. Careless handling and storing were responsible. (W. L. Gordon)

BLACK LEG (Erwinia phytophthora). Affected material was received on July 31 from Vallican, B.C. (D. B. O. Savile). The disease was present in 10% of the fields inspected in Alta. and 17% in Sask., but the amounts present were very small. Black leg was unimportant in Ont.; infection was less than half of what it was in 1939. Black leg was unusually prevalent in the Chicoutimi and Lake St. John districts, Que. Of 39 fields rejected out of 1,161 inspected, 21 were in the above districts. The weather was cool and wet in the early season. The disease was of little importance in N.B.; 6 fields were rejected on account of the disease out of 3,265 inspected. Some late infection was reported. Black leg was slightly more prevalent in N.S. than in 1939; it was present in 15 and caused the rejection of one field out of 641 inspected, infections ranging up to 2.6%. Seed treatment has been somewhat neglected due to the low prices for potatoes prevailing for the last 2-3 years. Twenty fields of 1,732 inspected were rejected for black leg in P.E.I., although it was less prevalent than usual.

STEM-END ROT (Fusarium Solani var. eumartii) was not observed this year in Ont. Many growers have obtained new seed. (O. W. Lachaine)

TUBER ROTS (Fusarium spp.). The following species were isolated from rotting tubers at Winnipeg, Man. in 1940: F. caeruleum, F. sambucinum f.6, F. Solani and F. oxysporum. The first two species were the most common (W. L. Gordon). Storage rot caused slight to severe damage in Irish Cobbler and Green Mountain throughout P.E.I., large quantities being destroyed during the winter 1939-40. Fusarium wilt developed in fields planted with affected stock. Isolations from affected tubers and wilted plants were of the identical organism. (R. R. Hurst)

WILT (Fusarium sp.) was present to some extent in Man., but only 3 fields were rejected for wilt as compared to 50 in 1939. The sharp reduction is largely due to the use of new seed, for according to W. L. Gordon the infection may readily come from the soil in the Prairie Provinces (W. J. Scannell). Fusarium wilt was the cause of rejection of 21 fields

in Ont. in 1940 compared to 30 in 1939. Fusarium wilt affected a few fields at St. Pascal and one at Riviere Bleue, Que., but no fields were rejected. A brownish discoloration of the xylem tissues affected 1-2% of Katahdin tubers in some fields around Millville, N.B. (J. L. Howitt). Examination revealed that this vascular necrosis (q.v.) was associated with a Fusarium sp. (F. S. Thatcher).

WILT (Fusarium and Verticillium) was present in 4% of the fields in Alta. and 15% in Sask. The disease appears to be most prevalent in Alta. about Edmonton and Calgary, where 2 fields were rejected; it appears to be increasing in Sask.

PSYLLID YELLOWS (Paratrioza cockerelli) was virtually absent at Medicine Hat, Lethbridge, and Calgary, Alta., in 1940. Only late in the season affected plants were observed here and there in a few fields near Lethbridge and one suspected hill was found at Calgary. Net necrosis of the tuber was associated with the attack by this insect as in previous years. Since pysllid yellows, as originally described, makes no mention of a net necrosis of the tuber, it would seem advisable during further investigation of these troubles to treat them separately (G. B. Sanford). Psyllid yellows was observed in one field entered for certification at the Experimental Farm, Lethbridge, Alta.; not over 5% of tubers were affected by severe necrosis. (J. W. Marritt)

PHOMA ROT (P. tuberosa) was observed in several lots of potatoes in P.E.I. in the spring, 1940. (R. R. Hurst)

BACTERIAL RING ROT (Phytomonas sepedonica). A survey was made in September by the Alberta Department of Agriculture in southern Alberta under conditions favourable for the detection of bacterial ring rot, but complicated by the presence of wilt due to Verticillium (q.v.), Fusarium, or other causes. Bacterial ring rot was found in 89 fields on 71 farms with an estimated acreage of 673.5 acres out of 262 fields examined. In all, 120 fields were judged healthy upon field examination; from the remaining 142, samples were taken and the disease was found upon microscopic examination by L. E. Tyner in 89, as already mentioned. In 1939, ring rot was found on 40 farms amounting to 179.5 acres. The disease is largely concentrated about Lethbridge in 8 contiguous townships embracing the most important potato growing district of Alberta. The other 3 townships centre about Retlaw, Barnwell, and Taber. Field evidence indicated that the use of diseased seed was responsible for its further spread. Serious outbreaks have been traced to uncertified seed, often of an unnamed variety, bought from a neighbour.

The disease has also been spread by the use of contaminated machinery, utensils, storage bins and sacks, and by the lending and borrowing of such equipment. One field at Lethbridge inspected for certification was affected; it was found in table stock on this farm in 1938 and 1939. The disease was also seen once at Medicine Hat.

Bacterial ring rot was found at Estevan, Sask. in a field of Early Ohio being grown for table stock; the seed had come originally from North Dakota. The disease was not found in any fields entered for certification. It was found at 6 points in Man. in 1940. At 5 places the disease had not been reported before, but on one farm at Birds Hill, Man., ring rot was suspected in 1938 and was definitely recognized in 1939. Premises and machinery were disinfected. The seed for 1940 consisted of carefully selected tubers of the varieties in which disease had been found in 1939 and also fresh seed. Nevertheless 6 out of the 7 varieties were diseased when examined in the field. These observations indicate that all potatoes produced on a farm should be disposed of and new seed obtained, as well as premises, machinery, bags, etc., being thoroughly disinfected. The growing of several varieties on a farm also increases the hazard of introducing the disease.

Bacterial ring rot was found in 14 farms in Ont. by the Inspection Service; one farm was in northwestern Ont., four in the Cochrane district, while the remainder were in Timiskaming, Parry Sound and eastward. Most of the fields were planted with certified seed. A study of the individual outbreaks indicate that the use of diseased seed is the commonest way for the disease to be introduced onto a farm. Some outbreaks point to the inoculation of sound seed by contact with contaminated bags, by storage in wholesale houses, where seed and table potatoes are handled by the same men and truck drivers.

Bacterial ring rot was found in 111 fields out of 1,161 entered for certification in Que. in contrast to 130 fields diseased out of 976 in 1939. The amount of disease in affected fields was also less, ranging from 7 to 25%. The disease was about as prevalent as usual in fields planted with table stock. On farms where ring rot was present in 1939 and where disinfection of the premises was made and certified seed used, no disease was present except in a few cases. Where it appeared again, some of last year's potatoes were still on the premises for use on the table during the summer. Certified seed planted in tuber units and in which a trace of bacterial ring rot was observed and carefully rogued out, as well as the rejection of all suspected units at digging time, yielded some tubers in which the disease was detected. (B. Baribeau)

Fewer fields entered for certification were found affected by bacterial ring rot in N.B. than in 1939. Very little disease was present either in the field or in the tubers at bin inspection. It was found on 151 premises. In fields planted with uncertified tubers, the disease was definitely due to replanting of diseased seed.

Bacterial ring rot was not observed in N.S. in 1940. A scattered crop of volunteer plants was found in the field showing the disease last year. Although the disease was not detected in them, they were dug up and burned. Twenty-five cases of bacterial ring rot were found in P.E.I. in 1940; 18 were in certified seed and 7 in table stock. In most fields only

a trace was present. None were on farms where the disease was found previously. Every hope is entertained that the disease will be eliminated if vigilance is maintained.

LATE BLIGHT (Phytophthora infestans) caused great losses to potato growers in Ont. In many fields, the disease was severe and at digging time 50% of the tubers were affected and many more rotted after they were stored (J. E. Howitt). Late blight was epidemic in 1940, this year being comparable to 1928 and 1934. The loss would be at least 20% of the late potato crop in central, western and northern Ont. (O. W. Lachaine)

Late blight was first observed in the Chicoutimi district on July 27, and a few days later about Montreal and the Eastern townships. It appeared at Ste. Anne de la Pocatiere on July 31, but it failed to develop on account of dry weather. It began to spread in early September there and elsewhere along the lower St. Lawrence; slight damage was caused, but traces were observed on almost every farm at bin inspection. Only a few cases of evident loss from tuber rot were noted. More growers sprayed than usually, 5 to 7 applications being made.

Late blight was more serious in N.B. than in 1939. It was first reported in an early planted field at Woodstock on July 12 and elsewhere in Carleton Co. on July 23. The same week it appeared in Victoria Co. The disease spread rapidly the week of August 4 to be checked 2 weeks later by dry, hot weather. A few table stock fields were completely dead about Bath on August 25. Late blight in various stages of development was present everywhere in September. About 30% of the seed stock was withheld from certification until Dec. 1.

Late blight was not general in N.S. in 1940. A slight infection was reported in Colchester Co. on July 26 and in Kings Co. on Sept. 24. Tuber rot was also not general. In Kings Co. where the largest potato acreage is found, only a very small amount was present. In 3 late fields of Irish Cobbler in Cumberland Co., 1-10% of rot occurred.

Late blight infection was generally slight in most sections of P.E.I. In fact, 1940 was not a "blight year". A few severe outbreaks were recorded, where the loss amounted to 50% of the crop. Rather heavy infections were found on Sebago, whose resistance is not of a sufficiently high order to be of much practical benefit.

LEAK (Pythium ultimum) was observed causing some decay at Salmon Arm and Summerland, B.C. Diagnosis of the disease was confirmed by W. Jones. (G. E. Woolliams)

SILVER SCURF (Spondylocladium atrovirens). A few lots were slightly affected in Que. The disease was noticed in a few lots of Irish Cobbler in N.B. Some silver scurf could be seen on tubers of the

new crop by November in P.E.I. One lot of Irish Cobbler was severely affected in April.

POWDERY SCAB (Spongospora subterranea) was found only on a few farms in Que. On two farms in the Bath area, N.B. infections of 7 and 10% respectively, were recorded. Traces were reported in other areas of Carleton and Victoria Counties. A trace of powdery scab was found in 4 or 5 fields of Bliss Triumph in N.S. and 40% of the tubers were affected in a half-acre field of Irish Cobbler. No powdery scab was recorded in P.E.I.

WILT (Verticillium sp.) caused the death of about 35% of the plants in a field at Ponoka, Alta. and it was present in several other fields at Calgary, Lethbridge and Edmonton. Verticillium was isolated from material from Ponoka and from some other points. Wilt due to Verticillium appears to be on the increase. Fusarium spp. were apparently less important as a cause of wilt since only saprophytic forms have been isolated (G. B. Sanford). Wilt was reported again in Cumberland Co., N.S. (cfr. P.D.S. 19:53 and earlier); the amount of wilt was small. Isolations from the affected material made by the Kentville laboratory yielded Verticillium (W. K. McCulloch). In 1940, 170 fields of Irish Cobbler were rejected in P.E.I. for Verticillium wilt compared to 67 in 1939. The disease is becoming more widespread in its occurrence from year to year. Conditions were particularly favourable this year for readily detecting wilt in the field for there was little rainfall and the symptoms were not masked due to attacks of early and late blight. (G. W. Ayers)

GIANT HILL (virus suspected). A trace to 1% of the plants were affected in a few fields in the Lethbridge district, Alta. Giant Hill affected 1% of the plants in a field of Green Mountain in Kings Co., N.S. Traces were apparent in other fields of Green Mountain and also of Bliss Triumph.

LEAF ROLL (virus) was present in 30% of the fields inspected in the Edmonton district, Alta., and in 50% of those about Lethbridge; infection ranged from a trace to 5%. It was chiefly in stock of Netted Gem brought to Alta. last spring. This disease was common, often in high percentages, in gardens in Edmonton and Calgary. Leaf roll, mostly in traces, was found in 9% of the fields inspected in Sask. The disease was rare in Man. Up to 1% of the plants were affected in some fields of Chippewa in the Thunder Bay district, Ont. Leaf roll appeared to be increasing in Ont.; 126 fields were rejected for certification in 1940 compared to 52 in 1939. In all, 26 were rejected on account of leaf roll in Que., compared to 5 in 1939; it was particularly prevalent at Ragueneau. Leaf roll was the greatest single cause for rejection in 1940 in N.B., where 323 fields were turned down for leaf roll. The disease has become a factor in seed production in counties, where it was previously unimportant. Leaf roll was reported in 57.8% of the fields inspected in N.S. and 3.4% were rejected. The disease was definitely on the increase in Green Mountain and Irish Cobbler in P.E.I.

MOSAIC (virus). A small amount of mosaic was present in stock of Netted Gem brought to Alta. last spring. It was prevalent in gardens in Edmonton and Calgary. Small percentages of mosaic were found in some fields; climatic conditions were favourable for the development of symptoms, and mosaic was observed in some lots not previously found affected. Mosaic was rare in Man. and northern Ontario. It was present in some plants of Chippewa. Mosaic was not particularly serious except in 4 fields where 15-30% of the plants were affected. Mosaic was slightly less prevalent in Que. than in 1939, although the symptoms were unusually clear. Mosaic was very severe at Ragueneau, where nearly 70% of the plants were affected in commercial plantings. Wet cool weather in June and July was ideal for the development of mosaic symptoms. This year 206 fields were rejected for mosaic in N.B. as against 112 in 1939. Mosaic was found in 54% of the fields inspected in N.S. and caused the rejection of 7.2%; it is becoming more noticeable in Katahdin.

In plots of the differentials at Fredericton, N.B. two plants of Samsun tobacco were found affected by strain L of Solanum virus 1 and 3 plants of Datura stramonium by strain G. A vein-banding mosaic caused by Solanum virus 2 was found in 2% of the plants of White Burley tobacco in a garden at Fredericton. (D. J. MacLeod)

PURPLE DWARF, which was called Purple Top in previous reports (P.D.S. 19:56), was again present in many fields throughout Alta. It appeared in the progeny of both certified and uncertified stock. The number of affected plants in a field rarely exceeded 1% and many fields appeared to be free from the disease. In a few special cases, 3-5% of the plants were diseased. Purple dwarf is perpetuated through the tubers and was transmitted to healthy plants by grafting. (G. B. Sanford)

One fifth of all fields inspected in Alta. contained a trace to 2% of affected plants. It was found in all parts of the province except the Perryvale district. A trace was also found in several fields in Sask. (J. W. Marritt)

?PURPLE TOP (see Purple Dwarf above) was found chiefly in Katahdin in N.B., but two cases were reported in Green Mountain. This condition appears in the plants late in the growing season and is easily rogued. (C. H. Godwin)

SPINDLE TUBER (virus) was not at all common in Man. and northwestern Ont. It was again found in Ont., but it is not prevalent; 4 fields were rejected on account of this disease as compared to 5 in 1939. Two fields were also rejected in N.B. Small amounts were present in P.E.I., but no fields were rejected.

STREAK (virus), possibly Leaf-drop Streak, affected a few plants of Irish Cobbler obtained from tubers showing symptoms of spindling sprout at Charlottetown, P.E.I. (R. R. Hurst)

WITCHES' BROOM (virus). A trace was present in a few fields inspected in Sask. A trace (2 plants) was found in a field of Chippewa at Upsala, Ont. and in another at Mattice. It had not been seen in Ont. for many years. (O. W. Lachaine)

YELLOW DWARF (virus) has not been observed as yet in Alta. (G. B. Sanford). Yellow dwarf was less prevalent in Ont. than formerly. In the Caradoc district, where the disease was most prevalent, more plants of Dooley went down than of any other variety in the test plots. With the replacement of Dooley by Katahdin, and to a lesser extent by Chippewa, both in the Caradoc district and elsewhere in Ont., yellow dwarf seems to be on the down grade.

DROUGHT NECROSIS was very common in fields throughout central and northern Alta. It was particularly noticeable in Netted Gem in unirrigated fields in southern Alta. (G. B. Sanford)

FAILURE OF TOP FORMATION. One field of Chippewa failed to form any tops at Garson, Man. Examination showed that the sets had produced tubers the size of marbles without sending up any shoots. These potatoes had been stored in a warm place and were badly wilted when planted. (J. W. Scannell)

FROST caused some injury in almost all districts of Que., but the damage was slight except in the Lake St. John district. Frost appeared there on Aug. 26 and some plantings were never dug on account of snow coming early. Considerable frost damage occurred in storage in P.E.I. because the tubers were not adequately protected from low temperature. (R. R. Hurst)

HOLLOW HEART was unusually common in the larger tubers of Irish Cobbler in a heavy crop running about 400 bu. per acre on Oct. 2 in P.E.I. It was observed later in several other lots.

INTERNAL BROWN SPOT (cause unknown) was seen in several lots of potatoes in P.E.I. in 1940.

NECROSIS. During a comparative histopathological examination of potato tubers showing several types of necrosis, data have already been accumulated that suggest that fungus pathogens are of greater importance in inducing vascular necrosis than has generally been realized. Specimens of a disease in Katahdin tubers from N.B., submitted as being induced by some cause other than parasitic activity showed a necrosis, with which was associated a Fusarium sp. (q.v.) as determined by cultural isolation and histological examination. A similar examination of specimens from Alberta of a necrosis reported to be common and widespread and submitted as a "drought necrosis" (q.v.) revealed the presence of a plentiful mycelium ramifying through the mature vessels inducing premature death of adjacent tracheids and occlusion of their lumina by colloidal and particulate de-

posits and by the excessive formation of tyloses, which in turn become necrotic. The resultant brown-stained matrix provides the macroscopically visible symptoms. Verticillium sp. (q.v.) has been isolated in culture from the affected tissues. From 13 samples of tubers showing phleom necrosis from B.C. sets were chosen from 5 tubers in each sample; all these sets developed plants showing leaf roll symptoms. (F. S. Thatcher)

A type of net necrosis said to be caused by the leaf roll virus is fairly common in certain potato stocks throughout Alta. and it develops in the absence of the tomato psyllid. (G. B. Sanford)

Net necrosis was severe in two fields planted with certified seed. One was near Calgary and the other near Edmonton. Fifteen vacant lots in Calgary were planted with certified seed from different sources. When the tubers were examined after harvest severe necrosis was present in those from half the lots, some showing 25% of the tubers affected. Necrosis caused by dry weather was prevalent in the Perryvale district. (J. W. Marritt)

Net necrosis was much more prevalent than usual in Que. It was particularly noticeable in several shipments of Green Mountain. (B. Baribeau)

Net necrosis was found chiefly in Green Mountain in N.B. and some lots were rather severely affected in the Centreville and Keswick areas.

PEPPER SPOT, which was first reported in 1939 (P.D.S. 19:56) appeared again in the same localities in Alta., but in general it was much less severe than in 1939, apparently due to different weather conditions. From further studies of the soil, it is concluded that this malady is caused by a too high concentration of black alkali in the soil.

STEM-END BROWNING is of increasing importance in N.B. It was the cause of 25 rejections in the spring of 1940. The discoloration does not penetrate more than $\frac{1}{2}$ of an inch in many cases. It has been found chiefly in Green Mountain. (C. H. Godwin)

PUMPKIN

POWDERY MILDEW (Erysiphe Cichoracearum) was severe on about 10% of the plants at Summerland, B.C.

RADISH

CLUB ROOT (Plasmodiophora Brassicae). A few plants were affected at St. Martin, Que., and at Charlottetown, P.E.I.

RHIZOCTONIA (R. Solani) was quite severe in a greenhouse at London, Ont. Isolations yielded Rhizoctonia Solani exclusively. (J. K. Richardson)

ROOT ROT (Sclerotinia sclerotiorum) affected about 10% of the plants in a garden at Portage la Prairie, Man. (J. E. Machacek)

BROWN HEART (boron deficiency) so affected the radishes in a garden at Charlottetown, P.E.I., that they were virtually useless. (R. R. Hurst)

RHUBARB

LEAF SPOT (Alternaria tenuis group) was observed at Macdonald College, Que. The Alternaria may be a saprophyte on spots caused by other fungi. (I. H. Crowell)

LEAF SPOT (Ascochyta Rhei) was found at Macdonald College, Que. (I. H. Crowell)

Phoma herbarum West. was found on a few cut flowering stalks, at Macdonald College, Que. It is probably a saprophyte. (I. H. Crowell)

LEAF SPOT (Phyllosticta straminella) was reported as follows: Slight infection on occasional plants at Brandon, Man.; general, but not severe at Norwich, Ont.; very severe in one small plot late in the season on Ile Bizard, Que.

RUST (Puccinia Phragmites) was heavy on the leaves at Clandeboye, Man. on July 7; telia were later found on Phragmites.

CROWN ROT (cause unknown) was noted at Macdonald College, Que. (I. H. Crowell)

SALSIFY

WHITE RUST (Cytopus cubicus). A moderate infection was observed in a field in the Montreal district, Que.

SPINACH

DOWNY MILDEW (Peronospora Spinaceae) moderately infected spinach at Morden, Man.

RUST (Puccinia subnitens) was reported from a private garden, at Saskatoon, Sask.

ROOT ROT (cause unknown). A destructive root rot was found in 10 seed plots of Long Standing Bloomsdale grown at various points in Man. The seed was all obtained from the same source. From 30 to 75% of the plants were destroyed. (J. E. Machacek)

SWEET CORN

BACTERIAL BLIGHT. A slight to moderate infection occurred in 2 plantings at Edmonton, Alta., and a trace was found at Lacombe.

RUST (Puccinia Sorghi). A trace was found at Brandon, Man.

SMUT (Ustilago Zeae) infection was moderate at Brandon and slight at Morden and Winnipeg, Man. Traces were common in the Montreal district, Que.

SWEET POTATO

ROT (Fusarium sp.). In sweet potatoes grown in Norfolk Co., Ont., a large number of tubers were badly blemished and unfit for sale on Dec. 4, 1939 though not severely rotted. (J. K. Richardson)

SWISS CHARD

LEAF SPOT (Septoria Betae) was general on the lower leaves of plants grown for seed at Sidney, B.C. (W. Jones)

TOBACCO

The tobacco disease report presented below was prepared by Dr. L. W. Koch. The records include information obtained from: Messrs. P. G. Newell, F. A. Stinson, and R. J. Stallwood in the New Tobacco Belt, from Messrs. H. F. Murwin and R. J. Haslam in the Old Belt of Ontario, and from Messrs. J. E. Montreuil and R. Bordeleau, L'Assomption, for the Quebec tobacco growing areas.

Diseases in the Seedbed

BLACK LEG (Erwinia aroideae?) was more prevalent than for several years, and caused the loss of large numbers of seedlings late in the transplanting season in Essex County, Ont. Infection was usually localized in seedbeds.

NEMATODES (Heterodera marioni). A single seedbed near Colchester, Essex Co., Ont. showed moderate infestation with nematodes. Plants were stunted and chlorotic.

BLUE MOULD or DOWNY MILDEW (Peronospora tabacina). A single case of this disease occurred in Kent Co., Ont. on a farm where the disease destroyed all the seedbeds in 1938. Although it did not appear on this farm in 1939, its re-occurrence in 1940 suggests that it may have passed the interval on hosts other than tobacco.

DAMPING-OFF (Rhizoctonia sp. and Pythium sp.) caused considerable damage throughout Ont. and Que., and by the end of the transplanting season was present to some extent in nearly all seedbeds. Damage to seedlings by this disease at the time of germination resulted in considerable reseeding in cotton-covered beds. Again at transplanting time the disease caused considerable loss of plants during a wet period.

BLACK ROOT ROT (Thielaviopsis basicola). In both the old and new tobacco belts of Ontario the disease was less prevalent in seedbeds than for several years. Though the soil of most tobacco seedbeds in Ont. is steamed, there have been indications that the fungus spreads from contaminated walks and walls in the greenhouses. Their disinfection with 5% formaldehyde has reduced infection.

Most cases developed late in the seedbed after pulling of the plants was begun. Three seedbeds in the old belt were diagnosed as too severely diseased for transplanting. As a result of lower than average temperatures, black root rot caused considerable damage throughout Quebec, particularly on susceptible varieties.

YELLOW PATCH (cause undetermined) was less prevalent in the old tobacco belt of Ontario than in 1939. Its presence was observed in sixteen seedbeds of Essex and Kent Counties, Ont. though damage was light. In the new tobacco belt the disease caused considerable damage. Careful chemical analysis of ten soils where yellow patch was severe and comparisons with as many more similar nearby areas where no disease developed indicated high nitrite concentration in all soil areas where the disease was severe.

Diseases in the Field

HOLLOW-STALK (Erwinia aroideae?). Two cases were observed on Harrow Velvet variety in Essex Co., Ont.; damage was mild.

NEMATODES (Heterodera marioni) were present in numerous fields of flue tobacco in the new belt of Ont. Damage was difficult to estimate.

SORE-SHIN (Rhizoctonia Solani) caused some damage soon after transplanting in both the old and new belts. Mildly-affected plants soon recovered.

BLACK ROOT ROT (Thielaviopsis basicola). Due to an unusually wet season, damage from black root rot was well above average. All burley varieties with the exception of Harrow Velvet sustained some damage. On quite a number of plantations in Essex Co., Ont., chiefly on heavier soils, the varieties Green Briar and Halley's Special became so severely infected early in the season that they were ploughed up.

All flue varieties showed damage, though in a plot containing numerous flue varieties at Harrow, Ont., on infested soil, one strain of Gold Dollar indicated a measure of resistance. In the new belt, black root rot could be found early in the season on nearly all plantations. The effect of the disease here was to delay growth, and this resulted in a greater loss of tobacco in August when frost destroyed all tobacco in certain areas.

MOSAIC (virus). In both the old and new tobacco belts of Ont., mosaic was less prevalent than in 1939. A small percentage was present in all fields, and in several cases where infection ran as high as 40% tobacco followed tobacco in the rotation. Considerable damage was reported from Que.

RING SPOT (virus). In the old belt, ring spot caused considerable damage on burley tobacco in localized areas. In one field, about 1,000 plants were severely affected; infection appeared to have started at the edge of the field, adjacent to which was a pasture with an abundance of weeds. A few cases of ring spot were also observed on flue tobacco in the new belt.

STREAK (virus) was less severe than in 1939. Only isolated cases of infection were observed in Ont., and not many infected plants in a group. Quite frequently, affected plants were located at the edge of fields.

BROWN ROOT ROT (cause undetermined) was more severe though less prevalent than in 1939. Of 24 cases of brown root rot observed in Essex Co., Ont., 16 were definitely traced to crops of corn immediately preceding tobacco in the rotation. Of these 16 cases, the variety was Harrow Velvet in 12 and Halley's Special in 2. On the Harrow Station, the disease was consistently severe following a crop of corn. In carefully prepared plots, Green Briar, a variety not previously tested, appeared to have a high measure of resistance. The varieties Kelley and one strain of Judy's Pride also showed some resistance. In the new tobacco belt, brown root rot was not as prevalent as in 1939 and caused little damage.

FRENCHING (non-parasitic) caused localized losses in both the new and old tobacco belts of Ont.

FROST INJURY. In the new tobacco belt of Ont., 45-60% of the flue-cured crop was destroyed by frost on the night of August 23. Local

areas close to the lake escaped injury.

LIGHTNING INJURY was observed in 3 fields in the old tobacco belt. In one case, all plants in a circular area, 75 feet in diameter, were either killed or injured.

MAGNESIUM DEFICIENCY was present in localized areas of the new tobacco belt. Damage was mild.

POTASH DEFICIENCY caused some damage on flue tobacco throughout the old and new tobacco belts.

UNEVEN RIPENING was less prevalent in the new tobacco belt than in 1939, and caused little damage.

WILT (cause undetermined). Symptoms of the disease consist of wilting, followed by necrosis of single leaves or leaves on one side of the plant. It was again prevalent in the North Leamington area of the old belt, and affected severely a field adjacent to one similarly affected in 1939 near Waterford, Ont., in the new belt. This disease did not become apparent until late in the season. Damage in general was not as great as in 1939.

In the Sumas district, B.C., 60% of the plants were affected by MOSAIC (virus) in one field, where tobacco followed tobacco, and affected volunteer plants were general. In 6 other fields, 64 acres in extent, the average number of plants affected was 2%. In these fields, an additional 1.5% of the plants were stunted and dwarfed, probably by a virus disease; the leaves were also lighter than normal. (W. Jones)

TOMATO

EARLY BLIGHT (Alternaria Solani). A trace was present on the older leaves at Winnipeg, Man. and a slight infection at Morden. It was observed in many fields in Laval and Jacques Cartier Counties, Que.; it caused more or less defoliation. It was also noticed at the Station, Ste. Clothilde de Chateauguay (E. Lavallee). The disease was moderate in a field at Charlottetown, P.E.I.

GREY MOULD (Botrytis cinerea). This fungus caused a ring spot of the fruit in a greenhouse at St. Catharines, Ont. In addition, it also caused a soft rot of a considerable number of fruit as well as the lower leaves and a few stems. Ring spot was also present on staked tomatoes in a field near Virgil. Almost all the fruit were infected in a row of tomatoes adjacent to a strawberry planting, where over-ripe strawberries were heavily infected by Botrytis. Some distance away there were several rows of tomatoes free from infection. It would, therefore, appear that the strawberries were the source of inoculum; G. C. Ainsworth, Enid Oyler and W. H. Read (Ann. Appl. Biol. 25:308-321. 1938) have given an account of the trouble. (G. H. Berkeley and G. C. Chamberlain)

LEAF MOULD (Cladosporium fulvum) was general in all of the 30 greenhouses inspected in the Victoria district, B.C., and the damage was severe. Vetomold was tested in 12 greenhouses and proved to be resistant in every one. It is rapidly replacing Best of All, the common commercial variety. Leaf mould was also found in the field at the Sidney Station this fall (W. R. Foster and W. Jones). All greenhouse crops were affected by leaf mould in Essex Co., Ont., in the fall of 1940; even the variety Vetomold showed 100% infection, thus indicating the widespread occurrence of strain 5 of the fungus (L. W. Koch). The disease was severe in a crop of Vetomold in a greenhouse at London, Ont. on July 10, when most of the crop was already harvested. (J. K. Richardson)

A high percentage of the tomatoes in a car lot from California developed spots after being placed in ripening rooms at Toronto in Nov. (J. K. Richardson)

Since Vetomold has only recently been introduced into the trade in Canada, it appeared desirable to include a brief history of its origin, which has been kindly supplied by Dr. Bailey.

The greenhouse tomato variety Vetomold was released from the Vineland Horticultural Experiment Station in the Fall of 1939, after having been developed as a result of a cooperative project between that Station and the University of Toronto. Of the three factors for resistance to Cladosporium fulvum investigated by Langford (See: Can. Jour. Res. 15, Sec. C:108-128. 1937), Vetomold incorporated only Cfp_1 or the factor from Lycopersicum pimpinellifolium conferring immunity from C. fulvum strains 1-4 inclusive. Although previous to its release it had been consistently immune, not only at Vineland but in various commercial houses as well, Vetomold proved completely susceptible in a number of greenhouses in several localities in Central and Western Ontario, after it was introduced commercially. Investigation indicated that it was infected by a hitherto unencountered strain of C. fulvum. This has been designated Strain 5 and is characterized by the following reactions: Potentate and Vetomold, susceptible; Stirling Castle, resistant; L. pimpinellifolium (Red Currant), resistant (but not immune). Since Vetomold is susceptible, the resistance of Red Currant to Strain 5 must be due to the second resistance factor (Cfp_2) which Langford discovered. Since esculentum varieties incorporating this type of resistance are almost ready for introduction, it has not seemed worth while to attempt the elimination or localization of Strain 5.

While Strain 5 is now encountered commonly on the Niagara Peninsula and in Central and Western Ontario (Hamilton, London, Windsor), we have no cultures of it as yet from elsewhere in Canada. From England and New Zealand too the word is that Vetomold has proven immune for one or two crops. We would greatly appreciate receiving from colleagues, samples of infected Vetomold for infection purposes. These should be directed to Vineland Station during the Summer or to the Department of Botany, University of Toronto, during the Fall or Winter. (D. L. Bailey and A. N. Langford)

The new variety, Globelle, produced at the Ohio Exp. Station, has also proved susceptible to a new strain of Cladosporium fulvum, although at first it was highly resistant (L. J. Alexander, Phytopath. 30:1. 1940). Whether this new strain is identical with strain 5 above, has not been reported.

ANTHRACNOSE (Colletotrichum phomoides) affected 9% of the fruit held in storage for 3 weeks at Macdonald College, Que. (I. H. Crowell and G. J. Heatherington)

SOFT ROT (Erwinia aroideae) was present in a field at Macdonald College, Que., and developed in tomatoes held in the laboratory. About 20% of the decay was due to this organism. (I. H. Crowell)

FUSARIUM ROT (F. sp.) was fairly common on fruit in the field and the laboratory at Macdonald College, Que. (I. H. Crowell)

NAILHEAD SPOT (Macrosporium tomato) caused damage which was mild and localized in Essex and Kent Counties, Ont. Late infection on 40% of the fruits was seen in several fields near Harrow (L. W. Koch). Three neighboring fields were badly affected on Ile Bizard, Que. Over 60% of the fruits were spotted and unmarketable. It is the first time I have observed the disease in the Montreal district (E. Lavallee). It was also recorded at Macdonald College. (I. H. Crowell)

WATERY ROT (Oospora lactis var. parasitica) was responsible for 30% of the decay in tomatoes held in storage at Macdonald College, Que. (I. H. Crowell)

BACTERIAL CANKER (Phytomonas michiganensis) was seen in both fields of commercial and seed crops in the Okanagan Valley, B.C.; usually only a trace to 5% of crops were affected, but in an occasional field it was destructive (G. E. Woolliams). The disease was found in material received from Aldershot, Ont. Smears disclosed a Gram positive organism, typical of P. michiganensis (H. N. Racicot and D. B. O. Savile). A few diseased plants were seen in one field at Longueuil, Que. (E. Lavallee)

BACTERIAL SPOT (Phytomonas vesicatoria). A slight to moderate infection of what was tentatively identified as this disease, was found in the plots at Lacombe, Alta. Bacterial spot was found on green fruit in the field at Macdonald College, Que.

BLACK SCAB (bacterial). A small black scab was found on green and ripening fruits of Fargo and Oklahoma varieties at Morden, Man. At first it was thought to be P. vesicatoria, but the organism that was common in the scab was definitely another. The leaves of tomato have been infected experimentally, but the fruits have not yet been tested. (W. A. F. Hagborg)

LATE BLIGHT (Phytophthora infestans) was found in a sample of diseased fruit from the west coast of Vancouver Island, B.C. (W. Jones). Tomato fields were observed this year in Ont., in which 30 to 40% of the fruit showed a peculiar brown rot. When these fruits were placed in a moist chamber a profuse white growth appeared on them. This growth proved to be the sporangiophores of a Phytophthora. The same species was present also in specimens received from various parts of the province this year. This is the first time I have observed P. infestans causing a serious rot on tomato fruits in Ont. It may be observed that in some cases where tomatoes were growing near potatoes, the fungus appeared to have attacked the potatoes first and had then spread to the tomatoes (J. E. Howitt). Damage to both foliage and fruit was severe in Kent and Essex Counties to the late tomato crop during the early part of the canning season. During the first week, loads of tomatoes at one canning company showed up to 25% of the fruit affected. The amount of damage then fell off sharply until by the end of the season damage was slight. (L. W. Koch)

Late blight infection was general late in the season in Kent and York Counties, N.B. The damage was usually slight, but in some fields 10-15% of the fruits were affected. (D. D. Dolan)

BUCKEYE ROT (Phytophthora palmivora or P. terrestris). Diseased material received at Ottawa was cultured and an organism tentatively identified as P. palmivora was isolated. The affected spots were brown, firm to leathery, but lacked the concentric zoning usually associated with buckeye rot. The trouble appeared to be causing extensive losses in Ontario (F. S. Thatcher). The disease was general in Lincoln Co., and in many fields caused severe losses. The rot was mostly of the leathery type (J. K. Richardson). About 5% of the fruits were affected in a 5-acre field at Berthier. Sporangia and sporangiophores developed abundantly in a damp chamber (E. Lavallee). Buckeye rot (P. parasitica) was observed at Macdonald College, Que. (I. H. Crowell)

SOIL ROT (Rhizoctonia Solani) caused a rot in the field during wet days in August at Macdonald College, Que., and in fruit held in a damp chamber in the laboratory. (I. H. Crowell)

RHIZOPUS ROT (R. sp.) caused 20% of the decay of tomato fruits in hot weather at Macdonald College, Que.; it was less prevalent when the weather was cool. (I. H. Crowell)

STEM ROT (Sclerotinia sclerotiorum). A small number of plants showed stem lesions in one greenhouse out of several examined in Middlesex Co., Ont. (J. K. Richardson)

LEAF SPOT (Septoria Lycopersici) moderately infected the plots at Brooks, Alta. (G. B. Sanford). It caused less damage to the early tomato crop in Essex and Kent Counties, Ont., than in 1939. In a few fields near Leamington, however, the disease was severe and the loss of crop was estimated at 40% (L. W. Koch). It was rather severe in a greenhouse at

London, and a light to moderate infection was noted in Lincoln Co. Leaf spot was observed at Macdonald College, Que.

WILT (Verticillium albo-atrum) was found in a third of the greenhouses in the Victoria district, causing a loss of 5-10% of the crop on both unsterilized and steam sterilized soils. (W. R. Foster)

MOSAIC (virus) affected 3% of the plants in a $\frac{3}{4}$-acre planting and 1% in a second in Lincoln Co., Ont. Mosaic caused by strain L. of Solanum virus 1 affected 5% of the plants in a field in Sunbury Co., N.B. (D. J. MacLeod). Mosaic affected 90% of the plants in greenhouses at Falmouth, N.S. in April; the fruit were small, but marketable. (J. F. Hockey)

SPOTTED WILT (virus). A few plants were slightly affected in a greenhouse at Edmonton, Alta. The virus was transmitted to Nicotiana Tabacum and potato by grafting. The tobacco became necrotic and stunted, and in the potato, the stem became necrotic near the scion (S. B. Clay). Spotted wilt was present on field tomatoes at Vineland, Ont. Spotted wilt was also present on tomatoes, gloxinia, African violet, calla lily, cinneraria, and begonia in a greenhouse at Paris. The tomatoes showed typical symptoms of spotted wilt (J. E. Howitt). About 5% of the tomato plants were affected. The virus was transferred by juice transfer from each of the above plants except the African violet. (G. H. Berkeley)

STREAK, MOSAIC, and FERN LEAF (virus) were general in greenhouses of oriental growers, who operate 60% of the greenhouses in the Victoria district, B.C. In nearly every greenhouse all plants were affected, with a 50% crop loss. The most virulent disease was streak (W. R. Foster). A few plants were affected by streak in a section of an 8-acre field at Westbank, B.C. A trace of streak appeared late in the season in the gardens at the University, Saskatoon, Sask.

STREAK and CUCUMBER MOSAIC (virus). An uncommon virus combination was encountered in an establishment near Aldershot, Ont. The plants were severely stunted, light yellow with or without necrosis of the leaves. Filiform leaves were abundant on many plants, especially in the top growth. Investigation indicated that these plants were infected with a combination of tobacco streak and cucumber mosaic viruses, both of which have been recovered from affected plants. In one greenhouse the infection was so severe that the plants were destroyed. It may be noted that the grower had plowed under the previous crop of tomatoes, which had shown some streak, and grew the plants for the present crop out doors near a melon patch, which had plenty of mosaic, thus accounting for the mixture of viruses. (G. H. Berkeley)

YELLOWS (virus). Traces were present in both seed and commercial crops in the Okanagan valley, B.C.; there wereat least some affected plants in every field. (G. E. Woolliams)

BLOSSOM-END ROT (non-parasitic) was common in gardens at Saskatoon, Sask. One grower at Aberdeen reported a loss of 50% of his crop. The trouble was common in the Brighton district, Ont., causing heavy losses which reduced the crop at least 40% according to the field manager for the local canning factories. From 30-75% of the fruits were affected in the fields of John Baere examined. High percentages were also noted in Chalk's Jewel and Bonney Best, while New York State was less affected (G. C. Chamberlain). Blossom-end rot was observed many times in the Montreal district, Que., but no severely affected fields were reported. (E. Lavallee)

BLOTCHY RIPENING (non-parasitic) caused slight damage in 4 greenhouses in the Victoria district, B.C. (W. R. Foster).

FRUIT POX (cause undetermined). A disease identical with the illustration and description of tomato fruit pox (see S. S. Ivanoff and P. A. Young, Phytopathology 30:343-345. 1940) was observed in one greenhouse near Victoria, B.C., on a variety being grown under the name One Hundred Fold. About 35% of the crop developed the symptoms. (W. R. Foster)

TURNIP

SCAB (Actinomyces scabies) was present in almost every field of turnips examined in L'Islet Co., Que., and caused considerable damage on turnips grown for the market. The Actinomyces isolated from the turnips differed considerably from A. scabies from potato (C. Perrault). Scab affected 5% of the roots in a small plot at the Station, Fredericton,N.B. (D. J. MacLeod). Traces were observed in 6 fields of Laurentian in the Freetown area, P.E.I. (R. R. Hurst)

POWDERY MILDEW (Erysiphe Polygoni) caused slight damage to the foliage of Laurentian stecklings in a field in Kings Co., N.S. (J. F. Hockey)

DOWNY MILDEW (Peronospora Brassicae) was general on a seed crop of Laurentian at Milner, B.C., but damage was a trace; a slight infection was also seen at Keating (W. Newton and W. R. Foster). Downy mildew was general in a field of Ditmar at Deep Brook and caused some dwarfing of the seed pods. (J. F. Hockey)

DRY ROT (Phoma lingam) was prevalent in one field in P.E.I.; otherwise only traces were observed. (R. R. Hurst)

BLACK ROT (Phytomonas campestris) was again prevalent on turnips in many parts of Ont. during the winter of 1939-40. (J. E. Howitt)

CLUB ROOT (Plasmodiophora Brassicae) caused at least 10% damage in a field in Colchester Co., N.S. (W. K. McCulloch). Some fields were severely attacked in P.E.I. (R. R. Hurst)

RHIZOCTONIA (R. Solani) affected the roots of 30% of the plants in a field at Deep Brook, N.S. It also caused a dry rot of 10% of the roots in storage at Sheffield Mills. (K. A. Harrison)

SCLEROTINIA ROT (S. sclerotiorum) was found affecting one plant in a field at Deep Brook, N.S.

MOSAIC (virus). In a plot of Wilhelmsburger, 0.5% of the plants were affected.

BROWN HEART (non-parasitic) slightly affected Swede turnips in a field at Saake, B.C. (W. Jones). A survey of table turnips made on 60 farms in L'Islet Co., Que., revealed brown heart to be prevalent on the majority of the farms. Where borax was applied to the soil the trouble did not cause any damage except on a few farms where the quantity applied was insufficient (C. Perrault). Brown heart showed a decided decrease in 1940, although many farmers do not yet use borax. (R. R. Hurst)

STERILITY (cause unknown) affected a trace to 1% of the plants in Laurentian and Wilhelmsburger varieties of Swede turnips for seed at Keswick N.B. The affected plants had a staring, upright appearance. The pods were pale green, reduced in size and extremely flattened and contained no seeds. The floral parts were also severely distorted and lacked the normal colour. The condition resembles that produced by Callistephus virus 1 in other plants. (D. J. MacLeod)

SUN BURN (non-parasitic). Nearly all turnips in certain trials at Macdonald College, Que., that were dug and left on the ground for a few days, were sunburned on the exposed surface. Most of these "burned" lesions become infected with a species of Heterosporium. (I. H. Crowell)

WATERY BULB (frost) affected a trace to 2% of the turnips in some lots at Charlottetown, P.E.I. The condition was duplicated by freezing the roots solid for long periods in our freezing chambers. (R. R. Hurst)

VEGETABLE MARROW

CURLY TOP (virus) affected nearly every plant in a field of the Green Trailing variety in the Grand Forks district, B.C.; affected plants produced no crop. (H. R. McLarty)

IV. VIRUSES ISOLATED FROM POTATO VARIETIES IN CULTIVATION IN CANADA - 1940[1]

by

D. J. MacLeod

Katahdin and Chippewa material from Prince Edward Island, Nova Scotia, and New Brunswick were found carrying, without symptoms, a weak strain of Solanum Virus 1, corresponding to that described by Dr. R. N. Salaman, F.R.S., as Strain G[2]. Plants so affected were tested by graft and sap inoculation against the necrotic S and N strains of Solanum Virus 1 and were found to be immune to these necrotic strains. The stocks carrying the G strain of Solanum Virus 1 do not seem to be affected by the presence of the virus. The G strain of Solanum Virus 1 is common in commercial stocks of Green Mountain, Bliss Triumph, Irish Cobbler, and Spaulding Rose, in which it is also carried without symptoms.

A mild type of mosaic caused by a strain of Solanum Virus 1 was found in Katahdin material from Prince Edward Island, Nova Scotia, New Brunswick, and Saskatchewan. The mottle produced is of a fine diffuse interveinal type, accompanied by a slight unevenness of the leaf blade. This mottle became less evident as the plant matured. The virus was identified as the mottling strain L of Solanum Virus 1. The effect on the yield is slight.

A severe mosaic caused by a strong strain of Solanum Virus 1 was found in Katahdin material from Prince Edward Island, New Brunswick, and Saskatchewan. The mottle produced is of a diffuse interveinal type accompanied by a marked unevenness of the leaf blade and a waviness of the margin. In addition, there are on the younger leaves, a few scattered necrotic spots, which usually do not enlarge or coalesce and seem to cause no serious change. The mottle persisted while the foliage remained green. This virus was also found combined with Solanum Virus 2 in Green Mountain and Irish Cobbler material from Prince Edward Island and New Brunswick. The combination of viruses caused a severe rugose mosaic and a foliar streak. This virus also caused a severe mosaic and a foliar streak in a number of potato seedlings grown in the open air at Fredericton. When tested on standard differentials, the virus was found to correspond to that described by Dr. Salaman, as Strain S,

---

1/ A similar section was prepared in 1939 by Mr. MacLeod (P.D.S. 19:69-74).

2/ Philosophical Trans. Royal Society of London, Ser. B. No. 559, p. 143. 1938.

Solanum Virus 1[3]. The reduction in yield is estimated to be from 15 to 20%.

A necrotic disease of virus origin was found in Chippewa material from Saskatchewan and New Brunswick. When the sap from infected plants was inoculated by the rubbing method into Chippewa and Arran Victory, local lesions ranging from 1 to 3 mm. in diameter developed on the inoculated leaves in 15 days. In 24 days, a blotchy interveinal mosaic appeared on the younger leaves which was soon followed by the development of fine necrotic lesions between and following the course of the smaller veins. These lesions enlarged, coalesced and in some instances involved the greater part of the leaf blade, causing a destructive foliar streak which resulted in the death of the leaves so affected. The destruction of the leaves progressed acropetally. In some cases only the apical leaves remained unaffected. The destroyed leaves remained hanging from 7 to 10 days. In a few plants, new leaves were formed which developed similar symptoms later in the season. The yield was materially reduced, only two or three small tubers being produced. The plants produced from these tubers in the second year developed a destructive foliar necrosis and were severely dwarfed. Most of these plants died after reaching a height of from 3 to 8 inches. The virus gave the typical reaction of the necrotic N Strain of Solanum Virus 1[4] on Datura Stramonium, Nicotiana Tabacum, Lycopersicon esculentum, Capsicum annuum, but differed from the type strain by producing a severe etching on the leaves of Solanum nodiflorum.

The conclusion arrived at in connection with the mosaics and streaks found in the Chippewa and Katahdin varieties is that these varieties are not resistant to Solanum Virus 1 and are gradually acquiring different strains of this virus under field conditions. The stocks which first acquired the weak symptomless strains do not seem to be affected by these viruses and are protected by them against the necrotic S and N strains. It would appear that the stocks which are not so protected will gradually be eliminated when attacked by the necrotic strains.

A severe rugose mosaic and leaf drop streak was found in the Earlaine variety. The disease was found to be due to a combination of strain S, Solanum Virus 1 and a strong strain of Solanum Virus 2. This variety is apparently not resistant to these viruses under field conditions. Two per cent of the plants in the field were so affected.

3/ Philosophical Transactions Royal Society of London, Series B, No. 559, p. 149. 1938.

4/ Philosophical Transactions Royal Society of London, Series B, No. 559, p. 153. 1938.

Worthy of mention in this connection is the fact that the aphid, Myzus persicae, was found causing injury in potato seedlings and some commercial varieties which resembled the necrosis present in the collenchyma of the stem and larger veins as well as the rugosity of the leaves produced by strong strains of Solanum Virus 2. In severely injured plants, there was also a leaf drop streak produced, resembling another characteristic symptom of Solanum Virus 2. In a few instances a top necrosis was produced in potato seedlings characteristic of that caused in some varieties by Solanum Virus 1 and Solanum Virus 3. These findings were also established by critical tests conducted under cage and greenhouse conditions.

A disease of virus origin was found in a number of potato seedlings grown under open air conditions. It is characterized by the development of numerous fine necrotic lesions occurring between and following the course of the smaller veins, culminating in a destructive foliar streak. Thereupon the margins of the top leaves become necrotic and rolled upwards, and the lower and middle leaves rolled downwards and showed a slight unevenness of the leaf blade. In extreme cases the necroses extended to the larger veins, midrib and the petiole. In the severest cases the necrotic tissue dropped out producing a shredded shot-hole effect. The necrotic areas were more evident on the upper surfaces of the leaves. Severely affected leaves collapsed and dropped off the plant. The virus was transmitted by grafting to a virus-free seedling and the Arran Victory variety in which typical symptoms were reproduced. Attempts to transmit the virus by the aphid, Myzus persicae, and sap inoculation to Nicotiana Tabacum, Nicotiana rustica, Nicotiana glutinosa, Datura Stramonium, Lycopersicon esculentum, Capsicum annuum, Solanum nodiflorum, Lycium chinense and the President and Arran Victory varieties were unsuccessful. The disease caused some damage to plants in the field. The virus appears to spread under field conditions.

An unusual disease of virus origin was found in potato seedlings grown in one of the testing greenhouses. The leaves of affected plants developed a superficial rusty necrosis which extended over most of the leaf blade, causing it to curl upwards and later to collapse. The dead leaves usually remained hanging on the plant. The destruction of the leaves progressed acropetally and in most cases only the apical leaves remained unaffected at the end of the season. The affected leaves have the appearance of being scorched by fire. There was no mottle. The virus was transmitted by grafting to a virus-free seedling and to the Arran Victory variety in which typical symptoms were reproduced. Attempts to transmit the virus by sap inoculation to Nicotiana Tabacum, Nicotiana rustica, Nicotiana glutinosa, Datura Stramonium, Lycopersicon esculentum, Capsicum annuum, Solanum nodiflorum, Lycium chinense and the President and Arran Victory varieties were unsuccessful. The disease caused considerable damage to a number of plants in the greenhouse in which it was discovered.

A severe phloem necrosis was found in the Green Mountain, Katahdin, Chippewa and Up-to-Date varieties. From 40 to 50% of the tubers in some of the laboratory plots planted with certified seed were severely affected early in October. The necrosis in most cases was confined to the stem end and the adjacent third of the tuber. In a few tubers, the entire phloem network was involved. Plants grown from Green Mountain tubers showing extreme phloem necrosis developed the following symptoms: The lower leaves showed a slight upward rolling while the middle ones developed a more definite rolling, accompanied by a slight rugosity and waviness of the leaf blade and margin. The top leaves were rosetted, severely puckered and upwardly cupped. All the leaves showed a diffuse interveinal mottle which was more intensified towards the top of the plant. A few of the plants, when from 2 to 4 inches in height, showed a definite downward rolling of the top leaves which later changed to the symptoms mentioned above. The leaves of affected plants were light green in colour and lacked the soft texture of normal foliage. Most of the plants had a staring upright appearance caused by the sharp angles between the leaf petioles and the stem.

A disease described as "purple top" in the 1939 report, page 74, was again observed in Chippewa, Katahdin and Green Mountain sources in commercial fields. The rate of infection was estimated at from a trace to 1%. Tubers from affected plants collected in 1939 with the exception of one case, produced normal plants the following year. In the single instance, tubers from a Chippewa plant which had purple top in 1939 produced plants which developed a downward rolling of the leaves and a waviness of the leaf blade and margin, accompanied by the production of purplish pigment chiefly along the margins of the top leaves. The upper leaves were rosetted and upwardly cupped. There were no tuber symptoms at harvesting time. A scion from an infected plant was grafted to Arran Victory. No symptoms appeared in the Arran Victory during the course of the growing season.

Three Green Mountain tubers brought from the Argentine by Mr. G. C. Cunningham were examined for their virus content. These tubers showed diffuse, brownish, necrotic areas ranging from 2 to 4 mm. scattered throughout the flesh. In one tuber there were disconnected necrotic streaks in the vascular system. Plants which grew from these tubers developed symptoms corresponding to that described in the 1939 report, pages 72-73. A virus was isolated from these potatoes which proved to be a varient of Lycopersicum Virus 3 (spotted wilt). The virus differed from the type virus by giving a much weaker reaction on tomato. The bronze ring-like secondary lesions were faint and almost entirely lacking. There appeared to be no symptoms on the fruit.

V. DISEASES OF FRUIT CROPS

APPLE

ROT (Alternaria Mali) affected 15% of the Fameuse apples in a number of barrels in the storage cellar of the Station, Fredericton, N.B. The rot was severe (S. F. Clarkson). A. Mali was isolated from a core rot of apple from the Winnipeg market, Man. This is the first record in Man. (J. E. Machacek)

ROT (Botrytis cinerea) was severe on 1% of the Fameuse and Mc Intosh apples in storage at the Station, Fredericton, N.B.

CONIOSPORIUM SCAB (C. Mali) lightly infected the leaves in an orchard in Sunbury Co., N.B. The fungus was compared and considered identical with material kindly loaned by W. R. Foster (see Dearness, J. and W. R. Foster, Can. Jour. Res. 16, Sec. C:274-276. 1938). (S. F. Clarkson and A. G. Turney)

LEAF SPOT or SHOT HOLE (Coniothyrium pyrinum). A slight to medium infection was reported at Morden, Man.

TWIG BLIGHT (Cytospora sp.) affected up to 30 % of the twigs in some orchards of McIntosh and Fameuse in York and Queens counties, N.B. (S. F. Clarkson)

FIRE BLIGHT (Erwinia amylovora) caused slight damage to several varieties of crab apples in the University orchard, Saskatoon, Sask. Six orchards in the north-eastern section of the province were free from disease. A fire-blight specimen from a Rescue crab apple planted in 1938 was received from St. Hubert Mission (F. L. Drayton). Fire blight was generally severe at Morden, Man. Fire blight occurred on 2 trees of Yellow Transparent at Macdonald College, Que., and on various ornamentals at Lennoxville, where the disease was severe causing the death of some trees. A slight amount also occurred in the orchard at Ste. Anne de la Pocatiere. Disease specimens were received from Huberdeau. Fire blight was not observed in commercial orchards, but was common in abandoned plantings and on roadside trees in P.E.I.

HEART ROT (Fomes applantus). Sporophores were collected from trees of McIntosh slightly affected by a basal heart rot at Summerland, B.C. (F. Welsh and G. E. Woolliams)

CANKER. A young McIntosh tree was killed in Carleton Co., N.B., by a large canker; Fusarium sp. was fruiting on the canker. (S. F. Clarkson)

ROT (Fusarium sp.). Of the storage rots in Fameuse apples at the Station, Fredericton, N.B., 3% was due to Fusarium sp.

ROT (Gloeosporium album). Of the storage rot in apples of McIntosh, Northwest Greening, and Fameuse at the Station, Fredericton, N.B., 40% was caused by this pathogen. (S. F. Clarkson)

BITTER ROT (Glomerella cingulata). A few barrels of Fameuse were affected while in storage at the Station, Fredericton, N.B.; 15% of the fruit were decayed.

RUST (Gymnosporangium spp.) Apple rust (G. Juniperi-virginianae) caused considerably less damage than in 1939 in Essex Co., Ont., neither the fruit nor foliage being severely infected, although the galls on the red cedar were very abundant. The disease was observed on McIntosh, Wealthy, Delicious and other varieties (L. W. Koch). Leaves of Wealthy were badly disfigured by apple rust in an orchard near Trenton; no rust was found on other varieties in the same orchard (J. E. Howitt). The foliage of Wealthy was also heavily infected in an orchard near Brighton (H. Hill). Leaves collected by Wm. Ferguson (6706) were found affected by G. Juniperi-virginianae (I. L. Conners). From 1 to 2% of the fruit of McIntosh and Fameuse were affected in a 7-acre commercial orchard at the Illustration Station, Bloomfield (A. E. Barrett). Telia of G. Juniperi-virginianae were collected on red cedar at Trenton (5849) and near Picton, (5888). (I. L. Conners)

Rust affected 1.5% of the fruit of McIntosh, 3.4% of Cortland, a trace of Delicious and Fameuse in the Laboratory orchard, St. Catharines, Ont. This is the first occurrence of rust in the Laboratory orchard. (G. C. Chamberlain)

Quince rust (G. clavipes) was usually only a trace in the orchard, Ste. Anne de la Pocatiere, Que., but low percentages were recorded on a few varieties, such as 10% on Kelso and Linton, and 5% on Alexander.

TWIG BLIGHT (Nectria cinnabarina). A trace was found on Rome Beauty and Ben Davis in Kings Co., N.S. (J. F. Hockey)

ANTHRACNOSE (Neofabraea malicorticis) was fairly general in the Fraser Valley, B.C., but considerable damage occurred in a few small orchards, where control was not attempted. On Vancouver Island the disease is less prevalent, due, it is believed, to the growers paying more attention to its control.

ROT (Penicillium expansum). This rot comprised 35% of the rots present on McIntosh, Fameuse, and Northwest Greening in storage at the Station, Fredericton, N.B. (S. F. Clarkson) It was also recorded at Macdonald College, Que., and Charlottetown, P.E.I.

TWIG BLIGHT (Phomopsis sp.) is common on Fameuse and McIntosh in York, Westmorland, Queens and Carleton Counties, N.B.; a Phomopsis sp. is often associated with the trouble. (S. F. Clarkson)

LEAF SPOT (Phyllosticta sp.). A slight infection was observed in an orchard at Edmonton, Alta.

BLACK ROT (Physalospora obtusa) was severe on Crimson Beauty in an orchard at Lakeville Corner, N.B.; it caused a leaf spot, canker, and fruit rot. (S. F. Clarkson)

CROWN ROT (Phytophthora Cactorum) continues to be the most serious apple tree disease in the Okanagan Valley, B.C. Evidence is accumulating that most of the crown rot is due to P. Cactorum. (M. F. Welsh and R. F. Fitzpatrick)

POWDERY MILDEW (Podosphaera leucotricha) was general on Vancouver Island and the Lower Mainland, B.C.; it caused considerable damage in a few orchards on Vancouver Island, due undoubtedly to the dry season in 1940 (W. Jones). Powdery mildew was found in the southern Okanagan, mostly on McIntosh, Jonathan, Northern Spy, Yellow Newtown, and Yellow Transparent. It was quite general this year, and caused russetting on much of the unsprayed fruit. Where the trees were sprayed for mildew the disease was kept in check (G. E. Woolliams). Powdery mildew was general on unsprayed trees in Lincoln Co., Ont. It was prevalent on apple trees in York and Kent counties, N.B., especially on young McIntosh (S. F. Clarkson). Young trees were heavily infected in an orchard at Hamilton, P.E.I. This is the first report of powdery mildew on apple in P.E.I. (G. W. Ayers)

WOOD ROT (Schizophyllum commune). The fungus was fruiting on many stubs in the orchards at Brooks and Edmonton, Alta.; no apparent damage was caused. The fungus was present on a number of trees affected by black heart in York, Queens, Kent, and Charlotte counties, N.B.

SILVER LEAF (Stereum purpureum) affected one tree of Yellow Transparent at Macdonald College, Que. Up to 15% of the young trees were affected in some orchards in York and Queen counties, N.B.; a rot of the trunk was noted as well as leaf symptoms. (S. F. Clarkson)

SCAB (Venturia inaequalis) was general and caused moderate damage on the Lower Mainland, B.C. (W. Jones). Apple scab was virtually absent at Lavington, B.C.; it was easily controlled at Salmon Arm, but where spraying was neglected, it was quite prevalent and caused considerable loss. In experiments conducted this year, apple scab was effectively controlled with 3 spray applications - pink, calyx, and cover - of wettable sulphur, to which was added lime sulphur 1-100 in the pink and calyx sprays. A programme of this type will probably become standard practice in the district. (G. E. Woolliams)

Apple scab was extremely prevalent and destructive in unsprayed or poorly sprayed orchards in many parts of Ont. All the fruit was disfigured by scab on many of the susceptible varieties examined. In spite of the wet weather in the spring, scab did not appear until well on into

June, but from that time on it spread rapidly. In spite of favourable weather conditions for scab development, over 90% of the fruit was clean in thoroughly sprayed, well-cared-for orchards (J. E. Howitt). Apple scab was prevalent in the Niagara Peninsula; foliage infection was very heavy in most orchards, but the fruit was kept remarkably clean where the spraying was well done. On unsprayed trees, 100% of the fruit were infected, while on trees in sprayed blocks 12-25% were scabbed. The initial discharge of ascospores occurred on May 14, when the buds were at the pre-pink stage. Primary infection was first noted on June 3 and was probably due to ascospores liberated during the major period of discharge, May 18-20. Cool weather and slow growth at this time, when the buds were in the pink stage, probably favoured infection. Secondary infection was prevalent shortly after the calyx period, June 21. (G. C. Chamberlain)

Apple scab control was nearly perfect in well-sprayed orchards in western Que. in 1940, and contributed in a large measure to the rapid sale of McIntosh and Fameuse apples in the fall. On the other hand, all orchards imperfectly sprayed produced a crop mediocre in quality and poor in appearance. The perithecia of V. inaequalis were very numerous, but rather late in their development. At the green tip stage, May 10-15, only about 5% contained mature ascospores. On unsprayed trees primary infection was quite numerous, but it occurred later than usual, viz. June 8-10. With the occurrence of rain, scab spread rapidly covering nearly all the foliage and fruit, in some orchards; calyx infection was quite frequent. During July and August, further spread was slight, but in September and early October, numerous pin-head infections made their appearance (F. Godbout). Apple scab was first noted on July 2 on McIntosh, Lobo, and Crimson Beauty at Ste. Anne de la Pocatiere, Que. The disease was easily controlled in well-cared-for orchards. (C. Perrault)

Apple scab was better controlled than usual in well sprayed orchards in N.B. However, in orchards left unsprayed, or where the applications of spray were poorly timed, apple scab was severe on both leaves and fruits. Ascospores were present in the asci on May 11, but were not mature until May 23. Perithecia were less numerous than in former years. Initial discharge was moderate on May 25, when the buds were in the pink stage. Primary infection was observed on the leaves June 28, and was already severe on unsprayed trees on July 3. (S. F. Clarkson)

Scab was not serious in N.S. in 1940. Ascospores matured early and perithecia were liberating spores before the buds were sufficiently advanced to become infected. Heavy spore discharges occurred soon after the buds opened and again when they were in the pre-pink stage. No ascospores were found by the time the calyx spray was applied in most orchards. New infections appeared on May 25 and by June 22, unsprayed trees had about 30% of the foliage affected. Very little spread took place during the summer and not over 75% of the fruit on unsprayed trees of McIntosh were scabby by harvest. On many other varieties, only 15-25% of the fruit became affected. Good commercial control of scab was obtained by 3-4 spray applications. (J. F. Hockey)

Traces only of scab were present in sprayed orchards, but it was severe in most of the smaller orchards. Ascospore discharge was late (June 4) and not very abundant at any time, yet primary infection was observed on June 12. (R. R. Hurst)

MOSAIC (virus) was definitely transmitted from a single Delicious tree, previously reported affected, to two young trees, one of Delicious and the other McIntosh at the Station, Summerland, B.C. Mosaic has not been observed on any other trees (T. B. Lott). A well defined mosaic was found on 100% of Wealthy trees and 45% of the Wolf River, in an orchard near Woodstock, N.B., and on all the Bethel at the Station, Fredericton (D. J. MacLeod). Many new reports of affected trees in N.S. have been received. Some roguing has been carried out in old orchards and private nurseries. Mosaic does not seem to seriously depress the yield. (J. F. Hockey) One McIntosh tree in a nursery row showed mosaic in P.E.I. (R. R. Hurst)

FALSE STING (virus) was found affecting a few trees in N.S.; the affected varieties were Gravenstein, Baldwin, Ben Davis, Northern Spy, Talman Sweet and McIntosh. It was recently shown to be a virus disease (Sci. Agr. 21:242-243. 1940). (J. F. Hockey)

BITTER PIT (non-parasitic). Serious losses from bitter pit were incurred by some growers in the Okanagan district, B.C. While these losses may be attributable in part to picking immature fruit and lightness of crop, there seems little doubt that climatic conditions favoured the disease this year, for even in the very resistant variety, McIntosh, instances of bitter pit were found (H. R. McLarty and R. E. Fitzpatrick). Bitter pit was found in one Baldwin tree in the Laboratory orchard, St. Catharines, Ont., 1% of the fruit being pitted. In 1939, it occurred on 9 out of 10 trees and 2-12% of the fruit were pitted. Northern Spy and Delicious were free from the trouble, although they were affected last year (G. C. Chamberlain). Bitter pit was less generally reported than usual in Ont. (H. Hill)

Sample lots of 400 Stark fruit per tree, picked Oct. 12 from 11 of the 14 orchards under survey, showed 0-5% of the fruit affected by bitter pit, an average of 1.12% for the 11 orchards. No bitter pit was detected on Stark in mid-September. It was reported in Gravenstein on Aug. 30. (R. Baylis and J. W. McLellan)

BLACK HEART (frost). McIntosh trees injured during the winter 1933-34 in N.B. showed black heart. (S. F. Clarkson)

DIE-BACK was rather severe on several trees of Schiawasse Beauty at the Station, Charlottetown, P.E.I.; according to J. F. Hockey the trouble was due to unfavourable growth conditions in 1939. (R. R. Hurst)

DROUGHT SPOT, CORKY CORE and DIE BACK (boron deficiency). There have been no commercial losses since soil applications of boric acid were adopted as the means of control in the Okanagan Valley, B.C. Treatment of the soil every 3 years at the rate of 30 lb. of boric acid per acre is the present recommendation (H. R. McLarty and R. E. Fitzpatrick). Drought spot caused slight damage in a small orchard at Sooke; the growing season was dry. (W. Newton)

In general, drought spot or superficial cork was much less prevalent in Northumberland, Durham, and Prince Edward counties, Ont., than usual. In the check plots of the experimental orchard near Brighton, where ordinarily drought spot affects 50% of the fruit, only 2% were affected this year. These observations are supported by the fact that very few samples of the trouble were received. (H. Hill)

A few barrels of Cortland apples were affected by internal cork at harvest time in a commercial orchard at Debec, N.B. (S. F. Clarkson)

FERTILIZER INJURY. About 100 young apple trees were set out this spring in an orchard in Northumberland Co., N.B., and received 7½ lb. of 4-8-10 fertilizer. Due to excessive rainfall during the summer most of the fertilizer was made available to the trees and resulted in their death. (S. F. Clarkson)

LEAF CURL (frost). About 5% of the first leaves formed in several orchard districts in N.B., were curled due to frost. The mid-rib was curled and the outer margin was destroyed. (S. F. Clarkson)

LEAF SCORCH (cause unknown). A mid-summer scorching of the marginal and interveinal parts of mature leaves caused serious defoliation in a number of orchards in the Okanagan Valley, B.C. It was particularly severe on Nowton and McIntosh. (R. E. Fitzpatrick and H. R. McLarty)

SPRAY INJURY. Due largely to the unusual weather conditions, copper burn was quite general on apple foliage in some orchards, particularly in Durham and Northumberland counties, Ont. In one orchard in the Niagara Peninsula, where the grower failed to add the lime in the making of Bordeaux mixture, the trees were nearly defoliated and the apples were badly marked and darkened. (G. H. Berkeley)

Russetting was very general and caused severe damage in many orchards in N.B., where Bordeaux was used in the pre-pink and calyx sprays. Some growers sold their fruit on a tree-run basis (S. F. Clarkson). In the Annapolis Valley, N.S., in orchards planted to mixed varieties, Bordeaux sprays are recommended for the delayed dormant and pre-pink sprays, followed by 3 sulphur applications. On varieties, particularly susceptible to russetting, it may be necessary to avoid the use of copper altogether. In 1940 considerable russetting resulted from the application of Bordeaux as a pre-pink spray. Severe russetting and cracking were present on Cox Orange sprayed with sulphur and lead arsenate. The iron-sulphate lime-sulphur with

calcium arsenate gave the best finish to Cox Orange. Russetting is closely associated with high humidity, but under Nova Scotia conditions, the present schedules have been found to give the least injury with adequate control of scab. (J. F. Hockey)

WATER CORE (non-parasitic) was moderate on King in October at the Station, Sidney, B.C.

APRICOT

POWDERY MILDEW (Podosphaera Oxyacanthae) was heavy on a seedling tree in a garden at Summerland, B.C. (R. E. Fitzpatrick)

DIE-BACK (boron deficiency). Several young orchards, which had not been treated with boric acid, came down with a serious die-back this spring at Peachland and Summerland, B.C. In one orchard 27 trees were affected out of 44. (R. E. Fitzpatrick)

FRUIT SPOT (cause unknown). False "drought spot" continues to be the only serious fruit spot of apricot in the Okanagan Valley, B.C. There are four fruit blemishes of apricot in B.C. (1) Drought Spot (boron deficiency) has been encountered once or twice. The symptoms are not the usual ones associated with drought spot. They have, however, been described by Aaken, H. O. and W. R. L. Williams (N.Z. Jour. Sci. & Tech. 20:103a-106a. 1939). (2) False "Drought Spot". The cause is unknown except it is not due to a fungus. (3) Coryneum Spot (C. Beijerinckii) occurs in the Kootenays, but not in the Okanagan. (4) Powdery Mildew (Podosphaera Oxyacanthae) spot or blemish is very uncommon and never of economic importance. (R. E. Fitzpatrick)

BLUEBERRY

RUST (Calyptospora Goeppertiana). A light infection was observed at Tusket, N.S. (G. W. Hope)

POWDERY MILDEW (Microsphaera Alni var. Vaccinii) was light at Wedgeport, N.S. on Sept. 5. (G. W. Hope)

BOYSENBERRY

LEAF SPOT (Septoria Rubi) was general and caused slight damage at the Station, Sidney, B.C.

MOSAIC (virus) affected up to 20% of the plants in a planting at Hatzic, and a few plants at the Station, Sidney, B.C. (W. Jones)

CHERRY

BLACK KNOT (Dibotryon morbosum). Traces were present in all orchards of sour cherries in P.E.I.; it was widespread and destructive on wild species. (R. R. Hurst)

SHOT HOLE (Higginsia hiemalis (Cylindrosporium hiemale) was severe on Republican in North Vancouver, B.C.; it was slight at the Station, Sidney, B.C. (W. Jones). Shot hole was present in epidemic form in Lincoln and Welland counties, Ont. The leaves became conspicuously infected early in the season and considerable leaf fall occurred before the fruit was ripe. All cherry orchards were affected to a more or less extent, some being defoliated early in the fall. The disease was more serious on sour varieties, but it was also present on the sweet (G. C. Chamberlain). Shot hole was very prevalent throughout Ontario this year. It was particularly destructive to sour cherries, many trees of which were almost completely defoliated by picking time (J. E. Howitt). A few trees were severely affected at Ste. Anne de la Pocatiere, Que. (L. J. S. Laporte). Shot hole was not serious this year in P.E.I.; infection was a trace to heavy on sour cherries and a trace on sweet. (R. R. Hurst)

Shot hole (Higginsia lutescens (Cylindrosporium lutescens) moderately affected cultivated sweet choke cherry at Brandon, Man.

POWDERY MILDEW (Podosphaera Oxyacanthae). A light infection was found on a few trees at Oliver and Osoyoos, B.C. No perithecia were present (T. B. Lott). A moderate infection was present on cultivated sweet choke cherry at Brandon, Man. This is the first record of powdery mildew on P. virginiana in Man.

BROWN ROT (Sclerotinia americana) slightly infected sour cherries, but none was present on sweet varieties at the Station, Sidney, B.C. (J. Maxwell). A few days of continuous foggy weather, very favourable for blossom blight, occurred while sour cherries were in full bloom and sweet varieties were just past that stage in Lincoln Co., Ont. From 5 to 25% of the blossoms were blighted. A special blossom spray was advised. Brown rot destroyed 5-25% of the fruit of sweet cherries in orchards in Lincoln Co.; where the spraying was not thorough or the full number of late applications was not made, infection was even more. (G. C. Chamberlain)

BLOSSOM BLIGHT (Sclerotinia cinerea) moderately affected sour cherries at the Station, Sidney, B.C., while sweet cherries were clean. A very slight amount of blight occurred in the Fraser Valley. (J. Maxwell and W. Jones)

LAMBERT MOTTLE (suspected to be virus) was severe on 3 trees, moderate on 3 and slight on one of the Lambert variety in the southern Okanagan, B.C. The survey covered 3,018 cherry trees, chiefly in the Osoyoos district. This may be the expression of mottle leaf or mild mottle in the Lambert variety. (T. B. Lott)

MILD MOTTLE (virus) was moderate in 2 and slight in 3 trees in the southern Okanagan, B.C. The symptoms are similar to those of mottle leaf, but it appeared to have little effect on the yield. (T. B. Lott)

MOTTLE LEAF (virus) affected 6 Bing, 3 Royal Anne (Napoleon), 1 Black Republican, 4 unknown, and 0 Lambert trees at Nelson City, B.C.; on the survey a single diseased Bing tree was found.

RING SPOT (probably virus) was found affecting one tree in Lincoln Co., Ont. (R. S. Willison)

TWISTED LEAF (virus). Only one additional tree was seen during the survey in B.C. Most affected trees are Bing. The disease has been transmitted to 5 young trees. The symptoms are: many leaves bilaterally unequal, portions of veins and petioles necrotic, leaf blades and petioles abruptly kinked, twisted sometimes into a spiral. (T. B. Lott)

CRINKLE (probably a mutation) was found affecting 120 Bing trees (48 completely); 10 Black Tartarian (2 completely); and 13 of unknown varieties (5 completely), a total of 143 trees in the southern Okanagan, B.C. (T. B. Lott)

FALSE SHOT HOLE (non-parasitic) was moderate on 11, slight on 20 and a trace on 12 out of 3,018 trees surveyed in the southern Okanagan, B.C. Scions from a tree that has been severely affected for 3 years, made normal growth when placed on a healthy young tree. (T. B. Lott)

INTERVEINAL MOTTLE (non-parasitic) was severe on 1 tree, moderate on 16, slight on 26, trace on 18 in the same survey. Usually the trouble is unimportant. (T. B. Lott)

LITTLE CHERRY (cause unknown) is general in an area about 35 miles long, embracing Nelson, Willow Point, and Sunshine Bay, B.C. It is causing a reduction of about 5,000 crates at the present time. Little cherry was first observed at Willow Point by H. R. McLarty in 1934 and has since been spreading slowly. Most fruits fail to reach normal size and remain red and low in sugar. It has not yet been found in the Okanagan Valley. (T. B. Lott)

RING SPOT MOTTLE (cause unknown) was found to be moderate on 7 trees, slight on 20, and a trace on 21, in the survey this year. It is usually associated with a heavy soil and excess water, but the presence of a virus is not entirely ruled out. (T. B. Lott)

SHOT HOLE (cause unknown) was moderate to severe on several Prunus hybrids and slightly affected other cherries and plums in the orchards at Lacombe, Alta. No evidence of fungus infection was found. (M. W. Cormack)

SPRAY INJURY from lime sulphur was moderate to severe on sweet cherries in Lincoln Co., Ont. It was probably associated with the wet conditions, slow drying of the spray, and succulence of the growth. (G. C. Chamberlain)

YELLOW LEAF occurred in numerous orchards in Lincoln Co., Ont. In some it could be associated with spray injury from repeated applications of Bordeaux or from Bordeaux alternated with lime sulphur. In other cases it seemed to be of a physiological nature. (G. C. Chamberlain)

CRANBERRY

LEAF SPOT (Gibbera compacta). Leaves slightly infected were received from Digby Co., N.S. (J. F. Hockey)

CURRANT

WHITE PINE BLISTER RUST (Cronartium ribicola). Complaints were received from many parts of Ont. that the rust was disfiguring the leaves of black currants. An examination of some of the plantings revealed that nearly all the leaves were heavily infected by rust and in some cases the bushes were completely defoliated early in September. It is probable that the same bushes were also attacked by Anthracnose and Septoria Leaf Spot (J. E. Howitt). In the currant plantation, Division of Horticulture, Central Experimental Farm, Ottawa, most susceptible varieties of black currants were considerably affected and susceptible varieties of red and white currants were slightly affected; no rust was seen on the gooseberry varieties. Rust was first recorded on black currants on June 27, and reached its maximum on July 18. The bushes were sprayed as in previous years with Bordeaux, the dates being May 7, May 18, and June 10 (H. J. Read). A study of the records for the past six years show that the rust was definitely more prevalent in 1940 than in any year since the present spray programme was started, but this may be accounted for by the rather cool wet spring and early summer.

The plantation of black currants on the Island of Orleans, Que., which was found badly rusted in 1939 (P.D.S. 19:86) was again heavily infected this year. The rust first appeared along the northern edge of the plantation near the woods. The rust developed more slowly this year than in 1939, but by Sept. 15 the foliage was covered almost throughout the plantation and became still heavier at the close of the season (O. Caron). White pine blister rust was heavy on black currants in N.B. and caused defoliation in some plantations in August (S. F. Clarkson). Infection was heavy in many gardens in P.E.I., both red and black currants being infected. (R. R. Hurst)

ANTHRACNOSE (Drepanopeziza Ribis (Gloeosporium Ribis). Infection was slight at Beaver Lodge, Alta., and severe on Red Lake and Minn 52., varieties of red currants, at Morden, Man.

SEPTORIA LEAF SPOT (Mycosphaerella Ribis (Septoria Ribis) was slight in a planting at Edmonton and moderate in one at Lacombe, Alta.

POWDERY MILDEW (Sphaerotheca mors-uvae) was severe on Climax, moderate on Boskoop Giant, Magnus and White Grape, while Fay Prolific was clean at the Station, Summerland, B.C. It was slight to moderate in the University orchard, Edmonton, Alta., and general but slight at Morden, Man.

GOOSEBERRY

RUST (Puccinia Pringsheimiana) moderately infected and partially defoliated several bushes at the Station, Kentville, N.S.

POWDERY MILDEW (Sphaerotheca mors-uvae) was present in the variety plots, Summerland, B.C. It was severe on Oregon Champion and Poorman, while Pixwell and Newton were clean. A slight infection was general at Morden, Man.; it does not appear to have been previously recorded in Man. on gooseberry (W. L. Gordon). Powdery mildew was recorded only on a few berries in P.E.I.

GRAPE

CROWN GALL (Phytomonas tumefaciens) was rather severe on a single vine for several feet above ground level about an extensive injury in a vineyard in Lincoln Co., Ont. (G. C. Chamberlain)

POWDERY MILDEW (Uncinula necator) was slight at the Station, Sidney, B.C. in October. The disease occurred commonly in Lincoln Co., Ont., but it was not as serious as downy mildew. Powdery mildew was rare at Macdonald College, Que.

DOWNY MILDEW (Plasmopara viticola). A very severe outbreak occurred in a 100-acre vineyard of Agawan in Lincoln Co., Ont. The disease was favoured by the heavy growth and excessively wet weather. No pre-blossom spray was applied, and it was thought that the Bordeaux had been applied late. In another vineyard, 75% of the fruit clusters of Fredonia were destroyed, infection apparently occurring previous to bloom, as many clusters failed to develop berries. It was also severe on Agawan, but Campbell's Early was free from infection. A moderate infection on the foliage was noted on Deleware in another vineyard (G. C. Chamberlain). A slight infection was found in a vineyard on Isle Bizard, Que. (E. Lavallee)

LOGANBERRY

DRY BERRY (Haplosphaeria deformans) was widely distributed on the Lower Mainland and Vancouver Island, it caused up to 30% loss of fruit. (W. Jones)

SEPTORIA LEAF SPOT (S. Rubi) was general and caused slight damage near Sidney, B.C.

PEACH

SCAB (Cladosporium carpophilum) caused moderate damage to Early Elberta in the Olinda district, but not elsewhere in Essex Co., Ont. (L. W. Koch)

BLIGHT (Coryneum Beijerinckii) caused severe damage in a large orchard in the Creston district, B.C., as a fruit spot, twig blight, branch canker with gummosis. A slight infection also occurred in 3 other orchards in the district. (W. R. Foster)

DRY ROT. Sporophores of Fomes pinicola and Polyporus hirsutus were collected by H. R. McLarty from trees suffering from a basal dry rot at Oliver, B.C. (G. E. Woolliams)

BACTERIAL SPOT (Phytomonas pruni). About 75% of fruit were more or less severely affected in a block of 550 trees of Burbank Crawford in an orchard at Port Burwell, Ont., but the leaves were apparently only lightly infected. Valiant, Eclipse, Globe, and Elberta were affected, but to much less extent, while South Hanen and Hale's Hanen were free from infection. Bacterial spot also occurred in an orchard at Port Dalhousie. Both orchards are located near the lake shore and were subject to increased dampness from fogs, etc., which would favour disease development. (G. C. Chamberlain)

BLOSSOM BLIGHT (Sclerotinia americana). On account of the wet weather during the blooming period, blossom blight was prevalent in peach orchards in the Niagara Peninsula, Ont., and increased the inoculum necessary for the development later of brown rot and added to the difficulty in the control of the latter. (R. S. Willison)

BROWN ROT (Sclerotinia americana) was serious in the orchard as well as in harvested fruit in the Niagara district, Ont., especially in early varieties, which ripened later than usual due to the cool wet weather prevailing in July and August. Considerable damage was done to twigs and small branches by the rotting of fruit on the tree. When spraying was done thoroughly and a full summer schedule was employed, it reduced the incidence of rot materially, but it did not give complete control. Control was made more difficult by an outbreak of blossom blight (q.v.) and the rotting of green fruit mostly at curculio and fruit moth punctures. Late varieties,

such as Elberta, suffered little damage in the orchard as weather was more favourable during their harvesting, but the incidence of rot in the harvested fruit was higher than usual. (R. S. Willison)

POWDERY MILDEW (Sphaerotheca pannosa) was quite prevalent in several orchards at Peachland, East Kelowna, and Summerland, B.C.; ordinarily infection is only slight (G. E. Woolliams). Scattered infection on the fruit was noted in an orchard in Lincoln Co., Ont.

LEAF CURL (Taphrina deformans). In general, infection was low in the Niagara Peninsula, Ont.; except when the disease is epidemic, it is of little consequence as the use of dormant sprays is almost universal (R. S. Willison). Leaf curl almost completely defoliated many unsprayed peach trees throughout Ont. this year (J. E. Howitt). The disease was heavy on young unsprayed trees at Avonport, N.S. (K. A. Harrison)

WILT (Verticillium sp.). Scattered trees affected by wilt were encountered in several young orchards in Lincoln Co., Ont. The cool, wet spring appeared to favour development. The occurrence of the wilt was associated with growing tomatoes on the same soil in recent years or as an intercrop. (G. C. Chamberlain)

MOSAIC (virus) was suspected in one tree in a 3-year-old orchard block in Wentworth Co., Ont.; the leaves showed peculiar angular spots and blotches, while some were puckered and the margins torn. (R. S. Willison)

PRUNE MOSAIC (virus) was transmitted from Italian Prune to peach by budding at the Laboratory, St. Catharines, Ont. It produces on peach a shortening of the internodes and a general dwarfing; some leaves show patterns (lines and rings). It has been observed in nature only on Italian prune, top worked on Damson plum. (R. S. Willison)

YELLOWS and LITTLE PEACH (virus). In the "control zone" in the Niagara Peninsula, Ont., there appears to be a very low incidence this year where rigid inspection and roguing were conducted in former years. (R. S. Willison)

A suspected virus disease was found affecting peach trees in the Okanagan valley, B.C. It is mostly concentrated in the southern Okanagan, where 121 affected trees were found among 7,086 examined, while only 2 were affected out of 8,456 examined in the central Okanagan and no disease was found in the Similkameen valley, where 1,402 trees were examined. The symptoms first appear in July or August as a yellowish mottle of the leaves on scattered twigs or branches of the affected tree, while adjacent parts apparently remain normal. The leaves soon show water-soaked areas, with a mixture of green, olive, yellow, red and purple colours. Brown papery spots develop and fall out. Defoliation of the shoots begins at the base and is often complete. Most fruits are small and drop prematurely. Dead twigs and branches occur in the second year. Trees probably become worth-

less in one or two years. A single diseased tree was found in 1939 out of 247 examined. In 1940, 8 additional diseased trees were found and the original tree was much more severely diseased. It is believed that all the diseased trees found this year were showing the symptoms for the first time. Growers have been made acquainted with the symptoms and advised to remove all affected trees, since they become useless in a year or two. (T. B. Lott)

FALL SPRAY INJURY. Lime sulphur injury was observed in orchards in the Niagara Peninsula as widely separated as Bartonville, Port Dalhousie and Stamford, where late November spraying was practised. In the Laboratory orchard, St. Catharines, peaches sprayed with lime sulphur 1:8 or lime sulphur 1:15, 3-6-40 Bordeaux or 3% oil in 3-6-40 Bordeaux on Nov. 1, 1939 showed little or no injury in the spring of 1940. On the other hand trees sprayed 3 weeks later, particularly young ones, were severely damaged by the lime sulphur sprays, but not by the Bordeaux or the Bordeaux-oil emulsion. The lack of injury from the Nov. 1st spray was attributed to the presence of leaves on the trees when they were sprayed. At the later date, leaf fall was almost complete, and leaf scars had protective layers in the early stages of development only and were thus easily penetrated by the spray material. (R. S. Willison)

INSECTICIDE INJURY. Several cases of killing of peach trees were investigated in Norfolk and Lincoln counties, Ont., where paradichlorobenzene was used to treat the trees for peach borer. In all cases the paradichlorobenzene was left around the trees all winter, and in one case the dosage was not carefully regulated. (G. H. Berkeley)

SUTURE SPOT (probably physiological), first reported and described in 1939 (P.D.S. 19:89), was prevalent this year in many orchards of the Beamsville-Grimsby and the Fonthill-Ridgeville areas. It was observed on Elberta towards the end of the harvest period. The trouble is in the nature of a breakdown highly restricted to location and extent of the affected tissue. Considerable variation in the number of fruits affected does occur. (R. S. Willison)

PEAR

FIRE BLIGHT (Erwinia amylovora). Very little blight was found in the Okanagan Valley, B.C. The eradication and inspection campaign conducted by the Provincial Department of Agriculture has kept the disease under control (G. E. Woolliams). Numerous hold-over cankers resulted in poor growth on Kieffer pears in an orchard in Lincoln Co., Ont.; some twig blight was also present. (G. C. Chamberlain)

POWDERY MILDEW (Podosphaera leucotricha) was quite general in the southern Okanagan Valley, B.C.; much of the fruit was reduced in grade due to blemish. Most orchards were not sprayed for powdery mildew, but where this was done, the disease was controlled satisfactorily. (G. E. Woolliams)

SCAB (Venturia pyrina) was negligible on all varieties at the Station, Sidney, B.C., except Anjou, which suffered moderate damage (W. Jones). Scab was severe on unsprayed trees in several counties in N.B. Scab was heavy on Flemish Beauty in an orchard in Queens Co., P.E.I., although it had been sprayed. (R. R. Hurst)

STONY PIT (virus) was moderate on the Bosc variety at the Station, Sidney, B.C., while Bartlett and Jules Guiot were almost free. (W. Jones)

BLACK END (cause unknown) was serious in some orchards in the Okanagan Valley, B.C., and was present to some extent in almost all orchards, particularly on Bartlett. (R. E. Fitzpatrick)

DROUGHT SPOT (boron deficiency). There were no commercial losses this year in the Okanagan valley, B.C., as most pear orchards have been treated with boric acid. (H. R. McLarty and R. E. Fitzpatrick)

PLUM

BLACK KNOT (Dibotryon morbosum) was very severe on unsprayed trees throughout N.B. The disease is severe in all uncared-for orchards in P.E.I. Young trees not yet bearing have been killed within two years from first becoming infected. (R. R. Hurst)

SHOT HOLE (Higginsia prunophorae) caused slight to severe damage throughout N.B. (S. F. Clarkson)

SHOT HOLE (Phyllosticta circumcissa) was moderate at Morden, and severe on some shoots at Brandon, Man.

BROWN ROT (Sclerotinia americana) was moderate on Peach Plum and Washington varieties at the Station, Sidney, B.C. Diseased fruits were sent from Outlook, Sask. Brown rot was exceedingly troublesome on peaches and susceptible varieties of plums during the past season. Unsprayed plum trees were observed on which over 70% of the fruits were rotted. Many baskets of peaches in transit to market were also destroyed (J. E. Howitt). Overwintered mummies on plum trees at Macdonald College, Que., produced the conidial stage in the spring (I. H. Crowell). Brown rot was affecting up to 15% of the fruit in a large commercial orchard near Moncton, N.B. in August.

PLUM POCKETS (Taphrina Pruni) was general and rather severe from eastern Ontario to P.E.I. in small unsprayed orchards.

SPRAY INJURY. Severe foliage injury was encountered in two orchards in Lincoln Co., Ont., from the use of lime sulphur 1-40, as a result of previous heavy rains and succulence of growth.

PRUNE

PRUNE MOSAIC (virus) was severe on one old Italian prune at Dog Lake, near Penticton, B.C. in 1938; slight symptoms were seen in 1940 in one adjacent tree that was normal in 1938 and 1939. The virus was successfully transmitted by top grafting from the diseased prune to 2 young prunes. Typical symptoms developed in 1940 from grafts made in the spring of 1939. Definite symptoms on peach, unlike those of any other peach disease resulted on the current season's growth when the trees were similarly top-grafted. (T. B. Lott) See p. 79 for its occurrence on peach.

RASPBERRY

DIE BACK (Armillaria mellea). Several plants were dying or dead in a new planting of Cuthbert in a low moist area at Hatzic, B.C. It also caused the death of individual plants in a few other plantings. (W. Jones)

SPUR BLIGHT (Didymella applanata) was general but the damage very slight on the Lower Mainland and Vancouver Island, B.C. Infection was heavy with extensive cane lesions in a nursery planting of Starlight in Ontario Co., Ont. Spur blight was very prevalent in most plantings in N.B. The disease was present in small amounts in many plantations in P.E.I.

ANTHRACNOSE (Elsinoe veneta) severely infected Lloyd George and Taylor, two very susceptible varieties, in a nursery in Elgin Co., Ont.

CANE BLIGHT (Leptosphaeria Coniothyrium) caused slight damage in a few Cuthbert plantings on the Lower Mainland, B.C.

YELLOW RUST (Phragmidium Rubi-idaei) was general on susceptible varieties, such as Cuthbert and Viking on the Lower Mainland and to a lesser extent on Vancouver Island, B.C. The damage was slight compared to previous years. The new variety, Winona, appears to be very susceptible.

CROWN GALL (Phytomonas tumefaciens) was severe in a $\frac{1}{4}$ acre planting at Boucherville, Que.; at least 30% of the plants were showing galls (E. Lavallee). Two plants were slightly affected in Queens Co., P.E.I.

LATE RUST (Pucciniastrum americanum). Most plantings of the Viking variety inspected in September or October were generally infected in Lincoln Co., Ont., and resulted in defoliation of the lower leaves. The canes, however, had made good growth and damage was negligible. The disease was also found on Latham, but to a lesser extent (G. C. Chamberlain). A considerable portion of the berries grown in the Renfrew district were unfit for sale on account of rust (F. Q. Dench). This rust attacked 20-75% of the berries and caused severe damage in one large planting of Viking and Newman in York Co., N.B.; it was not found elsewhere (S. F. Clarkson). A severe outbreak caused partial defoliation and marked 50% of the berries

at Hebron, N.S. (J. F. Hockey). A moderate attack occurred this year and severely damaged late berries in a Viking plantation in Queens Co., P.E.I.

LEAF SPOT (Septoria Rubi). Herbert was almost completely defoliated in a planting in Elgin Co., Ont., in mid-September. Viking was also heavily infected, but with considerable less defoliation (G. C. Chamberlain). Leaf spot was heavy in a planting at St. George, N.B. (J. L. Howatt)

POWDERY MILDEW (Sphaerotheca Humuli). A light infection occurred on Starlight at the Station, Summerland, B.C.; Lloyd George and other varieties were entirely free (M. F. Welsh). Powdery mildew was found in Latham plantings in nurseries in Lincoln Co., Ont. The canes were stunted and the terminal growth spindly. One planting of Viking adjacent to Latham showed scattered infections. It was of no importance in commercial plantings this year. (G. C. Chamberlain)

VERTICILLIUM WILT (V. sp.). A small area was slightly affected in a Viking nursery located in Lincoln Co., Ont. In the area the ground was low and poorly drained. In a fruiting plantation of Viking and Cuthbert, 3% of the canes were affected. (G. C. Chamberlain)

LEAF CURL (virus). Traces were seen in scattered plantations of Cuthbert in the Niagara Peninsula, Ont. (G. C. Chamberlain). Leaf curl was common on Viking raspberry in York, Sunbury, and Queens counties, N.B. It was also common on wild raspberry. (D. J. MacLeod)

MOSAIC (virus) is widely distributed in all parts of B.C. in numerous varieties; percentage of infected plants ranges from 3 to 80% and averages 20% (W. Jones). No mosaic was seen in the red raspberries at the Station, Summerland, B.C., but most plants of Sodus purpleberry in a 100 ft. row appeared slightly affected by a virus disease (H. R. McLarty). Most nursery plantings of Cuthbert, Viking, and Latham showed a trace to 30% of affected plants in Ont. Several Latham plantings were rejected for certification on account of mosaic. A high percentage of mosaic-affected plants was found in a planting of Chief, an unusual occurrence in Ont. Mosaic was also found in Taylor, but the percentage of affected plants was low (G. C. Chamberlain). Mosaic was very prevalent and quite destructive in some plantations in York Co., N.B. (S. F. Clarkson). In a planting in Queens Co., P.E.I., mosaic affected 2% of the Viking plants, 35% of Cuthbert, and 14% of Bomforth Seedling. (R. R. Hurst)

YELLOW BLOTCH CURL (virus). A small percentage of the plants was affected in several Cuthbert nursery plantings in Ont.; one planting could not be certified. The disease was also found in the Taylor variety. (G. C. Chamberlain)

POTASH DEFICIENCY was rather severe on Viking in a planting at Charlottetown, P.E.I. (R. R. Hurst)

SAND CHERRY

BROWN ROT (Sclerotinia americana) destroyed one third of the fruit in a planting at Luseland, Sask. Fruit and spur blight was severe at Morden, Man.

STRAWBERRY

FRUIT DECAY (Botrytis and Rhizopus) caused a loss of 30% of the fruit in 2 fields of Marshall, of 40 acres extent, on Lulu Island, B.C. The berries were attacked while they were still green. The fruit was hidden under profuse top foliage and the weather was very humid at the time. (W. Jones)

GREY MOULD (Botrytis sp.) was found in many plantations in Lincoln Co. Rank growth of plants and very wet conditions, which interfered with the harvesting of the fruit favoured disease development (G. C. Chamberlain). Traces were present at Macdonald College, Que., in Queens Co., N.B., and in P.E.I. Fruit from Arkansas was heavily infected when examined in Montreal.

LEAF SCORCH (Diplocarpon Earliana (Marsonnina Fragariae) was slight on British Sovereign and Horne at the Farm, Agassiz, B.C., and moderate on British Sovereign and Louise at the Station, Sidney. In commercial plantings, the disease was general on British Sovereign, but damage was only slight (W. Jones). Leaf scorch was severe in a planting of Howard's Supreme in Lincoln Co., Ont.

LEAF SPOT (Mycosphaerella Fragariae (Ramularia Tulasnei) was severe on the Simcoe variety, moderate on Borden, Laurier, Louise, and Bowell, and absent on Cartier, Abbot, Lavergne, Herman, and King at the Farm, Agassiz, B.C. It was also more severe on Simcoe than on other varieties at the Station, Sidney, B.C. The damage is negligible in commercial crops (W. Jones). Leaf spot was common throughout the Montreal district, Que., but it appears to cause no appreciable damage (E. Lavallee). The disease was common in N.B.; severe infections occurred in a few plantings at Douglas and Keswick Ridge (S. F. Clarkson). At Kentville, N.S., conidial production was slight throughout the growing season, except for a slight increase on the current season's foliage during moist weather in September (R. J. Baylis). Leaf spot was severe on Senator Dunlop, and moderate on Laurier and Agnes at Charlottetown, P.E.I. Some injury was apparent on Senator Dunlop. (R. R. Hurst)

BROWN ROT (Rhizoctonia Solani). A sample crate sent for examination from a shipment received in Montreal from Alabama was completely ruined by infection with Rhizoctonia. (I. H. Crowell)

FRUIT DECAY (Sclerotinia sclerotiorum). Sclerotia were found on the fruit of only a few plants of the Marshall strawberry on Lulu Island,

B.C. The organism was identified from a sub-culture as Sclerotinia sclerotiorum by F. L. Drayton. (W. Jones)

POWDERY MILDEW (Sphaerotheca Humuli)was exceptionally heavy in an acre field at Iberville, Que. causing a noticeable reduction of the crop. It was also reported in a few fields in Vaudreuil Co. (E. Lavallee). Powdery mildew was first observed in the variety trial plots at Kentville, N.S., on Aroma on June 11, and it spread subsequently to most of the varieties. On June 17, the disease was severe on Aroma, Edward and Nichomas; heavy on Charles; moderate on Senator Dunlop, Robert, Simcoe, John and Lemieux; and light on Jim, King, Magee, Cartier, Walter, Ralph, Macdonald, and Horace. In addition, infection was light on Premier at Berwick and heavy on Senator Dunlop at Debert (D. Creelman and J. F. Hockey). In the test plots, at Charlottetown, P.E.I. powdery mildew was estimated to be severe on Henry, King, Edward, Senator Dunlop, Macdonald, Cartier and Simcoe; moderate on Lilian, Claire, Paul, Walter, Martha, Lavergne, and Herman, and slight on Jim, Ralph, Horace, Agnes, Florence, Bowell, Tupper, Clarabell, McKenzie, John, Louis, and Charles. (R. R. Hurst)

CRINKLE (virus). Two affected plants were found in a planting in Carleton Co., N.B. (D. J. MacLeod)

MOSAIC (virus) affected 1% of Senator Dunlop plants in a planting near Charlottetown, P.E.I. (R. R. Hurst)

WITCHES' BROOM (virus) was found affecting several plants of Premier in a fruiting plantation at Berwick, N.S.; the disease was identified by Dr. Hildebrand. Some affected plants were rogued from clonal line nursery plantings. (J. F. Hockey)

YELLOWS (virus) moderately affected Blackmore at Macdonald College, Que. (I. H. Crowell)

ROOT ROT or BLACK ROOT (cause unknown) caused considerable damage in some plantings on Vancouver Island and the Lower Mainland, B.C. (W. Jones). The disease is apparently increasing in destructiveness in N.B.; it is very prevalent in the Grand Lake area. (S. F. Clarkson)

SCORCH (potash deficiency) was quite common in two plantations of Senator Dunlop, one at Montague and the other at Charlottetown, P.E.I.

YOUNGBERRY

LEAF SPOT (Mycosphaerella Rubi) was general and caused slight damage at the Station, Sidney, B.C.

VI. DISEASES OF FOREST AND SHADE TREES

ABIES BALSAMEA - Balsam Fir

Needle Cast (Bifusella Faullii Darker) has been observed each year for several years in P.E.I. (R. R. Hurst)

ACER - Maple

Leaf Spot (Phyllosticta acericola) was locally abundant on A. saccharum on Ile Perrot, Que. (I. H. Crowell)

Tar Spot (Rhytisma acerinum) was severe on two trees of A. saccharinum var. Wierii at the Covenanters' Church in Kings Co., N.S.

Wilt (Verticillium sp.) severely affected a tree of A. platanoides in Queens Co., P.E.I. This is the second case to be recorded. (R. R. Hurst)

AESCULUS - Horsechestnut

Leaf Blight (Guignardia Aesculi) was almost if not entirely absent on trees at Kentville and Grand Pre, N.S. (R. J. Baylis). A heavy infection was noted in Annapolis and Yarmouth Counties on Sept. 5 (G. W. Hope).

BETULA - Birch

Rust (Melampsoridium betulinum) was collected on B. fontinalis at Edson, Alta. (A. W. Henry)

CORNUS - Dogwood

Leaf Blight (Monilia Corni) was general in the woods as well as in residential areas in the Fraser Valley and Vancouver Island, B.C. Usually, there is a browning and dropping of individual leaves, but this year, the flowers as well were also discoloured and browned. (W. Jones)

FRAXINUS - Ash

Twig Blight. Hendersonia Fraxini was found fruiting on the small dead branches of a tree at Edmonton, Alta. (W. C. Broadfoot)

JUGLANS REGIA - Walnut

Bacterial Blight (Phytomonas Juglandis) was less severe than usual on the Lower Mainland and Vancouver Island, B.C. (W. Jones)

JUNIPERUS - Red Cedar

Rust (Gymnosporangium Juniperi-virginianae). A single gall caused by this rust was found on a red cedar tree planted this season at Abbotsford, Que. The tree was probably brought from Western Ontario. This is the first time that this species has been found in Quebec. Whether or not it can establish itself is impossible to say, but escapes of Juniperus virginiana are already established in the district since plantings were made 40 to 50 years ago. G. globosum now occurs on these trees. (H. N. Racicot and I. L. Conners).

PICEA - Spruce

Tip Blight was found on blue spruce at Medicine Hat, Alta.; Phoma sp. was isolated. (A. W. Henry)

Needle Blight (Rhizosphaera Kalkhoffii Bubak). From specimens from Ellwood Wilson it was concluded this fungus was rather abundant on blue spruce (P. pungens) at Knowlton, Que. The second and third year needles turn at first purplish and then brown. The fungus was in fruit on the brown needles. (Ruth Macrae and I. L. Conners)

PINUS - Pine

White Pine Blister Rust (Cronartium ribicola) appears to have become more prevalent in N.S. in recent years and now to be quite severe along the eastern shore particularly in the district between Halifax and Sheet Harbour (G. W. I. Creighton). All trees in one P.E.I. area examined on May 20 were affected; it was severe on most trees. (R. R. Hurst)

? Canker (Fusarium sporotrichoides Sherb.). The fungus was found fruiting on a branch of P. Banksiana received from R. M. Lewis, Preston, Ont., and was determined by W. L. Gordon.

Needle Cast (Lophodermium nitens). Infection was slight at Hudson, Que. and moderate at Truro, N.S. (I. H. Crowell)

POPULUS - Poplar

Leaf spot (Cladosporium subsessile) was common and in some cases severe on small trees of P. tremuloides at Edmonton, Alta.

Leaf spot (Marssonina sp.) was general at Summerland, B.C. on P. tremuloides. (G. E. Woolliams)

Ink Spot (Sclerotium bifrons) was observed on P. tremuloides, July 26, on Ile Perrot, Que. (I. H. Crowell)

Powdery Mildew (Uncinula Salicis) was severe on young trees of P. tremuloides and P. trichocarpa at Summerland, B.C. (G. E. Wooliams)

SALIX - Willow

Scab (Fusicladium saliciperdum) moderately affected a hedge of S. laurifolia at the Station, Ste. Anne de la Pocatiere, Que. (R. O. Lachance). Sprayed trees of S. vitellina at Grand Pre, N.S. were healthy, while the infection was light elsewhere. (K. A. Harrison)

Black Canker (Physalospora Miyabeana). The fungus was fruiting freely on a number of cankers collected on a specimen willow at Abbotsford, B.C. The imperfect stage was abundant, but the perfect stage was also present. F. saliciperdum was present on the petiole of a leaf, the only leaf material enclosed. Additional material collected in August, showed numerous cankers covered with ascervuli, but no Fusicladium could be found on the blighted leaves. (I. L. Conners, A. W. McCallum and J. E. Bier)

Powdery Mildew (Uncinula Salicis) was general and severe on willows in the southern Okanagan Valley.

THUJA - Arbor vitae

Blight (Phomopsis juniperovora Hahn) was very common on white cedars (T. occidentalis) in the Georgian Bay district, Ont. Many of the trees on the roadsides and in the swamps had most of the terminal leaves browned. This is the first time I have observed this blight causing injury in Ont. (J. E. Howitt)

ULMUS - Elm

Black Spot (Gnomonia ulmea) was widespread in York Co., N.B.; it caused yellowing of the leaves and early defoliation. (J. L. Howatt)

BERRY BOXES

Inspection revealed that of six different lots of berry boxes all were contaminated by Rhizopus nigricans. In two lots, contamination was heavy, while the other lots showed only scattered contamination. Some boxes were stained badly with Penicillium. (G. C. Chamberlain)

INSECTS

A severe aphid infestation was greatly reduced in the potato fields in York, Carleton, Victoria, and Sunbury counties, N.B. when at least 65% of the aphids were destroyed by Empusa Aphidis in the first two weeks of September. (J. L. Howatt)

A severe infestation of the sod web worm near the N.B.- N.S. border was believed controlled in June, according to Mr. R. P. Gorham, by an organism identified as a species of Empusa. (J. L. Howatt)

VII. DISEASES OF ORNAMENTAL PLANTS

ALTHAEA ROSEA - Hollyhock

Leaf Spot (Cercospora althaeina). A slight infection was recorded at Morden, Man.

Leaf Spot (Colletotrichum Malvarum (Braun. & Casp.) Southw.). A slight infection was observed at Morden, Man.; first record for Manitoba.

Rust (Puccinia Malvacearum) was recorded across Canada as follows: Widespread on Vancouver Island and the Lower Mainland, B.C.; severe late in the season at Winnipeg, Man.; very prevalent in Ont., and injured many hollyhocks so badly that the beauty of the plants at flowering time was destroyed; moderate infection at Ste. Anne de la Pocatiere, Beaumont and Lennoxville, Que.; damage much less in a young, more open planting than in an older crowded one; severe on several plants at Grand Pre, N.S.; in general heavy and destructive throughout P.E.I.

ANTIRRHINUM - Snapdragon

Grey Mould (Botrytis cinerea) destroyed some plants of snapdragon and clarkia in Lincoln Co., Ont., by the decay of the crown; the weather was cloudy and dull.

Wilt. Fusarium Solani, F. Solani var. Martii, F. Scirpi, F. Scirpi var. acuminatum and F. oxysporum forma were associated with a wilt of snapdragons in the Winnipeg area, Man. (W. L. Gordon)

Rust (Puccinia Antirrhini) was reported widely: General on Vancouver Island and the Lower Mainland, B.C.; moderate damage to a seed crop at Keatings in July; very destructive at Summerland; severe infection in some plantings in the Winnipeg area during September; slight damage in a greenhouse in August at Sussex, N.B.

Drop (Sclerotinia sclerotiorum) caused severe damage in one garden at Summerside, P.E.I.

Yellows (virus) affected several plants in a garden at Charlottetown, P.E.I.

AQUILEGIA - Columbine

Powdery Mildew (Erysiphe Polygoni) lightly infected some leaves and flower stalks at Summerland, B.C.

ASTER

Powdery Mildew (Erysiphe Cichoracearum). A moderate infection occurred on occasional plants at Morden, Man.

AZALEA - Rhododendron

Leaf Curl (Exobasidium Vaccinii) was present on a few plants of A. Hinodegiri in a garden at Clayburn and in a nursery at Burnaby, B.C.

BERBERIS - Barberry

Rust (Puccinia graminis) affected green and purple barberries (B. vulgaris) rather heavily at Upton, Que. Mature aecia were seen at Saint Andrews and St. Stephen, N.B. on July 3, while they were still im-

mature at Shediac on July 6. Aecia were just appearing at Grand Pre, N.S. on June 4. A few affected leaves were seen in Queens Co., P.E.I.

CALLISTEPHUS - China Aster

Wilt (Fusarium conglutinans var. Callistephi) affected about 20% of the plants in the beds at the Station, Ste. Anne de la Pocatiere, Que. (R. O. Lachance)

Yellows (virus) was observed on several varieties in the garden at the Station, Agassiz, B.C., the highest infection being 10% in Peach Blossom; occasional plants at Cartwright, Man.; prevalent in beds containing several varieties at the Arboretum, Ottawa, Ont.; all the plants in 5 gardens examined in Queens Co., P.E.I.

CARAGANA

Polyporus Tulipiferae was abundant on a few plants at Macdonald College, Que.

Leaf Spot (Septoria Caraganae) caused slight damage at Edmonton and Lacombe, Alta.; severe leaf spot and drop at Brandon, Man., and a moderate infection at Morden.

CELOSIA - Cockscomb

Yellows (virus) was severe on a few plants of cockscomb in Queens Co., P.E.I.

CENTAUREA

Leaf Spot (Septoria ?centaureicola Brun. var. brevispora Pk.) moderately infected C. suaveolens and C. imperialis at Morden, Man. A rather short-spored Septoria was found. This is the first record of Septoria on the above hosts in Manitoba. (W. L. Gordon)

CHRYSANTHEMUM

Wilt (Botrytis cinerea) affected about 75% of the cuttings of Mistletoe in the propagating bed and those already rooted at Falmouth, N.S. in May; other varieties were less affected.

Powdery Mildew (Erysiphe Cichoracearum) was very destructive on several greenhouse varieties at Charlottetown, P.E.I.

Leaf Spot (Septoria Chrysanthemi). A slight infection was found in a greenhouse at Lacombe, Alta.

CLARKIA

Rust (Pucciniastrum Epilobii) caused severe defoliation at Lennoxville, Que.; Epilobium sp. growing as a weed in the border was also heavily infected. (D. B. O. Savile)

CLEMATIS LIGUSTICIFOLIA

Leaf Spot (Septoria Clematidis). A moderate infection was present at Morden and Brandon, Man.

COREOPSIS

Powdery Mildew (Sphaerotheca Humuli var. fuliginea) affected about 10% of the leaves of C. grandiflora at the Station, Summerland, B.C.

COSMOS

Grey Mould (Botrytis cinerea). Abundant sclerotia were found on old stalks in a garden at Kentville, N.S. (J. F. Hockey)

COTONEASTER

Dark Berry (Phytophthora Cactorum) was general and caused severe damage to C. horizontalis in the Victoria and Vancouver districts, B.C., in the fall of 1940. (W. Jones)

CRATAEGUS - Hawthorn

Leaf Spot (Entomosporium Thuemenii) was relatively severe on August 30, imparting a brownish tinge to the entire clipped hedge at Lennoxville, Que. (D. B. O. Savile). This leaf spot was reported to have been observed for the past 3 years on C. Oxyacantha at Pocologan, N.B.; brown spots appear in August and the leaves fall off. (I. L. Conners)

Rust (Gymnosporangium clavariaeforme) caused severe damage, in a nursery at Courtenay, B.C., to C. Oxyacantha. (W. Newton)

DAHLIA

Stem and Blossom Blight. Fusarium Scirpi was associated with a stem and blossom blight of dahlias at Winnipeg, Man. (W. L. Gordon)

Mosaic (virus). Many varieties are showing symptoms at Charlottetown, P.E.I.; the damage is severe. (R. R. Hurst)

DELPHINIUM - Larkspur

Powdery Mildew (Erysiphe Polygoni) was quite heavy early in the season at Summerland, B.C. The disease was severe and frequently caused complete defoliation at Beaumont and Ste. Anne de la Pocatiere, Que. Powdery mildew was widespread in York Co., N.B., late in the season. It was severe on all plants in one garden at Kentville, N.S. Many plants were severely damaged in Queens Co., P.E.I.

Bacterial Blight (Phytomonas Delphinii) was reported as follows: Severe in a garden at Gull Lake, Sask.; severe on an occasional plant at Morden, Man.; abundant, causing moderate damage at Lennoxville, Que.; heavy on 3 plants in a border at Wolfville, N.S.; slight to severe in Queens Co., P.E.I.

Mosaic (virus). Several cases of mosaic were reported in P.E.I.

DIANTHUS

Root Rot was severe in a large outdoor planting of carnations at Edmonton, Alta. causing the death of some plants. Fusarium avenaceum was isolated from the diseased roots. (S. B. Clay)

Leaf Spot (Heterosporium echinulatum). A slight infection was present on greenhouse carnations at Victoria and the Station, Sidney, B.C.

Rust (Uromyces caryophyllinus). Infection was severe in green-

house carnations at Edmonton and slight at Lethbridge, Alta. Rust apparently caused some damage at Cap de la Madelaine, Que. (L. J. S. Laporto). Rust caused moderate to severe damage on King Cardinal in a commercial greenhouse at Sussex, N.B.

Root Rot was severe in a greenhouse at London, Ont. The carnation plants were robust when planted, but 5 weeks later they had thrown no new roots from the original ball of soil. Some varieties were more severely affected than others, but none had made normal growth. The trouble was apparently due to excess salt concentration, for after the affected beds were thoroughly leached with water, the plants outgrew the trouble. (J. K. Richardson)

DIMORPHOTHECA

Crown Rot (Botrytis cinerea). A few plants wilted in a bed at Kentville, N.S.; B. cinerea was isolated in pure culture from diseased tissue. (J. F. Hockey)

EVONYMUS ALATA

Twig Blight (Diplodia ramulicola Desm.) was quite heavy on twigs of this shrub collected by Dr. Irene Mounce at the Station, Sidney, B.C.

One affected twig bearing perithecia of a Gibberella was sent to Dr. W. L. Gordon. He found the asci in the perithecia immature, but the presence of abundant sporodochia of Fusarium lateritium Nees in close proximity to them, when they were planted on agar, suggests that the perithecia represent the perfect stage of this fungus, which is Gibberella baccata (Wallr.) Sacc. F. Scirpi var. acuminatum was also isolated by him, but to a very slight extent. (I. L. Conners)

FRESIA

Blindness affected 75% of fresias in a shipment received from California on August 27, and planted October 15 in a greenhouse of the Dale Estate, Brampton, Ont. This trouble develops if corms are stored at 55°F. or lower; the recommended temperature is 65°F. (F. L. Drayton and W. A. Fowler)

GLADIOLUS

Botrytis Rot (B. cinerea). Some 4,000 to 5,000 corms were affected by Nov. 22, at Long Branch, Ont. The corms were harvested Oct. 1, cleaned Oct. 15, and the rot first noted on Nov. 1. The trouble was probably due to poor storage conditions. (F. L. Drayton)

Yellows (Fusarium oxysporum forma) affected occasional plants of the primulinus varieties at Morden, Man.; a slight infection was also noted at Winnipeg and at Clearwater Bay, Lake of the Woods, Ont. (W. L. Gordon). As a root rot, this disease (F. sp.) caused slight damage in an Edmonton garden, and killed some plants in a planting at Lacombe, Alta. Very little of this disease developed in P.E.I. in 1940.

Corm Rot. Fusarium oxysporum f. Gladioli was isolated from corm rot of gladioli at Winnipeg, Man.; infection was slight. (W. L. Gordon)

Penicillium Rot (P. Gladioli) was severe as a storage rot in one cellar in Winnipeg, Man.

Bacterial Blight (Phytomonas Gladioli). A slight infection was found at Lacombe, Alta.

Scab (Phytomonas marginata) was general, but the damage was slight on Vancouver Island, B.C. (J. E. Bosher). A slight infection was found in several plantings at Edmonton and Lacombe, Alta.

Dry Rot (Sclerotinia Gladioli) was generally distributed, but the damage was slight on Vancouver Island, B.C. (J. E. Bosher)

Hard Rot (Septoria Gladioli) was affecting a few corms in a lot grown in Queens Co., P.E.I.

GLOXINIA

Spotted Wilt (virus) affected the entire lot of 50 plants in a greenhouse in Lincoln Co., Ont. (G. C. Chamberlain)

GODETIA

Root Rot. Fusarium Solani and Cylindrocarpon radicicola were associated with a root rot and wilt of Godetia in the University gardens, Winnipeg, Man. (W. L. Gordon)

Rust (Pucciniastrum Epilobii) was severe in a private garden late in the season at Saskatoon, Sask.

HELLEBORUS NIGER - Christmas Rose

Leaf Spot (Coniothyrium Hellebori) was severe on the leaves of a few plants at Metchosin, B.C. (W. R. Foster)

HELIANTHUS - Sunflower

Powdery Mildew (Erysiphe Cichoracearum) slightly infected ornamental sunflowers at Morden, Man.

HELIOPSIS

Powdery Mildew (Erysiphe Cichoracearum) was also slight on heliopsis at Morden; the first record of its occurrence on this host in Man.

IRIS

Cladosporium herbarum was exceedingly abundant on the leaves of iris at Macdonald College, Que. (I. H. Crowell)

Eelworms (Ditylenchus dipsaci) affected 3-5% of the plants in bulbous iris plantings of 3 growers in the Fraser Valley and on Vancouver Island, B.C.; none were present in plantings of 5 other growers. (R. J. Hastings)

Soft Rot (Erwinia carotovora) affected occasional plants at Brandon, Man. It was observed for the first time at the Laboratory, Ste. Anne de la Pocatiere, Que., where it was moderate to severe; the spring was particularly rainy. (R. O. Lachance)

Root Rot was severe in one garden in Saskatoon, Sask.; Fusarium and Pythium spp. were isolated. (T. C. Vanterpool)

Leaf Spot (Heterosporium gracile) was reported as follows: General and severe at three growers and a trace or absent at 5 others in B.C.; moderate infection in a planting at Edmonton, Alta.; general, varying from slight to moderate at Brandon and Morden, Man.; rather severe in Victoria Park, Niagara Falls, Ont.; very heavy infection at Beaumont, Que., in a garden where the leaves are not regularly removed, but slight at Ste. Anne de la Pocatiere; exceedingly abundant on certain varieties of the Iris collection at Macdonald College; moderate infection at Kentville, N.S., new leaves began to be infected on May 23 at Wolfville.

Ink Disease (Mystrosporium adustum) caused severe damage in 3 plantings of bulbous iris in B.C. (R. J. Hastings)

Grey Bulb Rot (Sclerotium Tuliparum). In an outdoor planting of bulbous iris at a nursery in Esquimalt, B.C., in an area of 100-150 sq. ft., every plant was rotting at or near the soil level with sclerotia in the decayed soil "I have not encountered this disease before", writes R. J. Hastings on Jan. 22, 1941. The organism was cultured and determined to be Sclerotium Tuliparum. (F. L. Drayton)

LATHYRUS ODORATUS - Sweet Pea

Yellowing or Root Rot (Fusarium and Rhizoctonia) was common in many gardens at Charlottetown, P.E.I.; in addition 22 enquiries were received concerning this disease. (R. R. Hurst)

Powdery Mildew (Microsphaera diffusa) was light to heavy in Queens Co., P.E.I., in August (R. R. Hurst)

Mosaic (virus). A trace of pea mosaic (Pisum virus 2) was found on sweet pea in 2 gardens at Fredericton, N.B. (D. J. MacLeod)

Streak (virus) caused slight to severe damage in Queens Co., P.E.I. (R. R. Hurst)

Root Rot (cause undetermined) destroyed occasional plants at Brandon, Man.

LAVATERA

Root Rot (Fusarium oxysporum forma). Scattered plants were killed at Brandon, Man.; isolations yielded a form of F. oxysporum only. (W. L. Gordon)

LIGUSTRUM - Privet

Leaf Spot (Cercosporella) was reported severely injuring a Lodense Privet hedge, in Waterloo, Ont. Some of the infected leaves were sent to Dr. J. Dearness, who concluded the pathogen was an undescribed species of Cercosporella. If the extent and severity of the disease this year is any criterion, the fungus is capable of causing very severe injury to privet. (J. E. Howitt)

LILIUM - Lily

Blight (Botrytis elliptica) was severe on scattered plants at Morden, Man. Many plantings of Madonna and Regal lilies were disfigured by this blight in 1940; in one garden, over 30% of the plants were markedly injured by the disease (J. E. Howitt). The disease was quite severe on L. Hansenii at Charlottetown, P.E.I.

Rust (Uromyces Holwayi) slightly infected L. polyphyllum x L. Humboltii at Duncan, B.C.

LONICERA - Honeysuckle

Blight (Glomerularia Lonicerae) caused considerable defoliation of the lower branches of the more susceptible spp. at Lennoxville, Que. (D. B. O. Savile)

LUPINUS PERENNIS

Leaf Spot (Septoria lupinicola Dearn.) was reported to be rather severe in several gardens at Pembroke, Ont. (F. L. Drayton)

LYCIUM HALIMIFOLIUM

Powdery Mildew was very prevalent, nearly all leaves being affected at Summerland, B.C.; only the oidial stage has been found. (G. E. Woolliams)

MALOPE

Root Rot. Scattered plants were killed at Brandon, Man.; isolations yielded a form of Fusarium oxysporum only. (W. L. Gordon)

MATTHIOLA - Stocks

Root Rot. Fusarium Solani was associated from a root rot and wilt of stocks in the University gardens, Winnipeg, Man.

NARCISSUS

Smoulder (Botrytis narcissicola) caused 5-30% damage in early varieties and 1-5% in late ones in the Fraser Valley and on Vancouver Island, B.D., where the bulbs were not treated; only a trace was present in treated narcissi. (R. J. Hastings)

Eelworms (Ditylenchus dipsaci) were general and caused severe damage in plantings of 18 growers out of 35 in B.C.

White Mould (Ramularia vallisumbrosae). A trace occurred in isolated areas on Vancouver Island, B.C., affecting Sir Watkin, Ornatus, Golden Spur. (R. J. Hastings)

Leaf Scorch (Stagonospora Curtisii) was general in all B.C. plantings; the damage was very slight.

Mosaic (virus). A single plant was affected in a home garden at Ste. Anne de Bellevue, Que. (I. H. Crowell)

Virus diseases affected a trace to 2% of the plants in 46 fields, 2-20% in 19 and 20-50% in 3, in the Fraser Valley and on Vancouver Island, B.C. Severely affected varieties were - Lucifer 90%, Southern Gem 60%, Mme. de Grey, 50%, Princeps 47%, Queen of North 30%, and Incomparable 28%. (R. J. Hastings)

NEMESIA

Root and Crown Rot (Sclerotinia sclerotiorum). Several annuals were affected in a large planting at Edmonton, Alta. Sclerotia were usually present in the decayed tissues. The damage was as follows: Moderate to severe on Nemesia; slight on Salvia; and a trace on Alyssum, Lobelia, Petunia and Scabiosa.

PAEONIA - Peony

Blight (Botrytis Paeoniae) was reported as follows: Severe on Souvenir de Bretonneau, Duchesse d'Orleans; and moderate on Beauty of France, Reine de Hortense, Eugene Verdier and Magnifica at the Station, Sidney, B.C.; slight infection in plantings at Edmonton and Olds, Alta.; slight infection on Marguerite Gaudichan at Morden, Man.; about 25% of the flower buds on most varieties were blighted before opening in the beds at the Station, Ste. Anne de la Pocatiere, Que., severe at Lennoxville; severe damage to the buds and leaves in a planting in Saint John Co., N.B., but damage slight at the Station, Fredericton; many outbreaks reported in Queens Co., P.E.I.

Leaf Spot (Cladosporium Paeoniae) was moderate on Souvenir de Bretonneau and Charlemagne; and a trace on Marguerite Gerard, Mme. d'Hour, Duchesse d'Orleans, and Magnifica at the Station, Sidney, B.C. (W. Jones). A trace was found at Macdonald College, Que.

Ring Spot (virus). A slight infection was present on a few varieties at Morden, Man. A well defined ring spot with slight dwarfing was observed at the Station, Fredericton, N.B.; attempts to transmit the disease by sap inoculations were unsuccessful. (D. J. MacLeod)

Chlorosis and Distortion (virus suspected) has been affecting one plant in my garden at Charlottetown, P.E.I., for some years; it has now spread to other plants. (R. R. Hurst)

PELARGONIUM - Geranium

Leaf Spot and Blight (Botrytis cinerea) was general in October in the beds at the Station, Sidney, B.C.; its spread was favoured by rainy weather.

PENTSTEMON

Leaf Spot (Ramularia sp.) was severe on P. grandiflorus, P. unilateralis, P. secundiflorus. (W. L. Gordon)

PETUNIA

Mosaic (virus). About 10% of the petunias in a private garden at Fredericton, N.B., showed a definite veinal mottle caused by Solanum virus 2. The virus was proved by transmitting it to the standard differentials. (D. J. MacLeod)

PHLOX

Powdery Mildew (Erysiphe Cichoracearum) was severe in a single garden at Summerland, B.C. It was widespread and severe on perennial phlox in gardens in York and Sunbury counties, N.B.

Leaf Spot (Septoria divaricata) slightly affected phlox in the beds at Ste. Anne de la Pocatiere, Que. (R. O. Lachance)

PRIMULA

Bacterial Leaf Spot (Phytomonas Primulae Ark & Gardner). A leaf spot was found on P. polyantha near Victoria, B.C. by W. R. Foster. It agreed well with the symptoms given by P. A. Ark and M. W. Gardner (Phytopath. 26:1050-1055. 1936), irregular circular brown lesions on the older

leaves surrounded by conspicuous yellow halo; spots reach 5-8 mm. in diameter and when abundant, coalesce. Bacteria were abundant in the tissue. (I. L. Conners)

RHAMNUS - Buckthorn

Rust (Puccinia coronata) was very severe on plantings of cascara (R. Purshiana) at Green Timbers Forest Nursery, B.C., according to J. E. Bier. Rust had killed some of the terminal shoots. Specimens were received on May 15 from G. S. Allan (I. L. Conners). Mature aecia were present on R. cathartica in the Arboretum, Ottawa, Ont., on June 8 (H. A. Senn). Pycnia were present on June 1, and aecia were just opening on June 11 at Macdonald College, Que. (I. H. Crowell). A severe infection was present on twigs and leaves of R. Frangula on June 11 at the Station, Fredericton, N.B.; most of the aecia were open on June 17. Aecia were very prevalent on leaves, stems, and fruits on hedges and trees of R. cathartica on July 3 at St. Andrews; no rust was found on the same day on buckthorn at St. Stephen (S. F. Clarkson). A moderate infection was noted on R. cathartica at Charlottetown, P.E.I. on June 27. It was also recorded from Kings Co. (R. R. Hurst)

RHODODENDRON

Leaf Spot (Pestalozzia sp.) caused considerable damage to 70 bushes at Royal Oak, near Victoria, B.C. (W. R. Foster)

RIBES

Leaf Spot (Septoria Ribis) severely infected the leaves of an ornamental hedge of R. oxycanthoides. This is the first record in Manitoba on this host. (W. L. Gordon)

ROSA - Rose

Canker (Coniothyrium Fuckelii). Scattered infections occurred on E. J. Ludding hybrid tea in Lincoln Co., Ont.; entrance was gained through pruning stubs. (G. C. Chamberlain)

Black Spot (Diplocarpon Rosae (Marssonina Rosae) was reported as follows: Generally distributed and causing slight to moderate damage on the Lower Mainland and Vancouver Island, B.C.; severe on Persian Yellow, and slight on Harrison's Yellow in the University gardens, Saskatoon, Sask.; severe on Etoile de France at Winnipeg, Man.; heavy on Hybrid Tea roses about Guelph, Ont. and rather severe causing complete defoliation late in the season on some varieties in Lincoln Co.; occasionally severe in Queens Co., P.E.I.

Leaf Spot (Mycosphaerella rosicola (Cercospora rosicola). A slight infection was reported at Morden, Man.

Rust (Phragmidium spp.). P. speciosum was severe on Banshee and Betty Bland, moderate on Tetonkaha, and a trace on Kamschatka in the University gardens, Saskatoon, Sask. A diseased cane of Betty Bland was received from St. Hubert Mission. A severe infection occurred in June at Winnipeg, Man. A bush of Betty Bland in the Macoun Memorial Garden, Experimental Farm, Ottawa, Ont., was badly infected. Last year's canes

were covered with sori, while this year's were clean to all appearances.

Rust was common on Rosa rugosa in a bed at Ste. Anne de la Pocatiere, Que. Rust (P. americanum) was moderato to severe on hybrid roses at Kentville, N.S. (R. J. Baylis). Rust was occasionally severe in Queens Co., P.E.I.

Powdery Mildew (Sphaerotheca pannosa) was quite prevalent on a few susceptible varieties at the Station, Summerland, B.C.; most varieties were free from infection. The disease was moderate on Etoile de France at Winnipeg Man. Powdery mildew was very prevalent and destructive particularly to certain Rambler varieties in many parts of Ont. The disease was observed causing slight damage in Three Rivers, Two Mountains, Terrebonne, and Berthier counties, Que. Powdery mildew was quite common and destructive in P.E.I., particularly on Crimson Rambler, Hybrid Perpetuals and Dorothy Perkins; dusting with extremely fine sulphur has given good results.

Witches' Broom (?virus) was observed affecting some canes at Morden, Man.; the number of spines was greatly increased on affected canes.

RUDBECKIA - Golden Glow

Powdery Mildew (Erysiphe Cichoracearum) was reported at Summerland, B.C.

SOLIDAGO - Goldenrod

Rust (Coleosporium Solidaginis) severely infected and destroyed the leaves of some ornamental goldenrods at Morden, Man.

SYRINGA - Lilac

Powdery Mildew (Microsphaera Alni) caused slight damage in gardens at Fredericton, N.B.

Blight (Phytophthora Syringae) slightly infected leaves and more particularly young shoots as they emerged from the ground near the main branches at Ste. Anne de la Pocatiere, Que. This is the first time the disease has been observed at Ste. Anne. The wet spring was probably very favourable for the disease. (R. O. Lachance)

Mosaic (?virus). About 2% of the lilac bushes at the Station, Fredericton, N.B. show a definite mosaic. A diffuse veinal mottle is present in most leaves of the affected bushes. (D. J. MacLeod)

TAGETES - Marigold

Yellows (virus). Scattered plants of Crown of Gold were affected at Morden, Man.

TULIPA - Tulip

Dry Rot (Armillaria mellea). Brown or blackish decayed areas with rhizomorphs attached were found on a few bulbs in Vancouver, B.C. (J. W. Eastham)

Fire (Botrytis Tulipae). Primary infection was severe in 17 fields, slight in 30 and absent in 2 out of 49 fields examined on the Lower Mainland and Vancouver Island, B.C. First infections were observed on Feb. 19 (R. J. Hastings). A rather extensive infection was seen in a perennial bed

in Lincoln Co., Ont. (G. C. Chamberlain). Fire caused a great deal of damage in many parts of Ont. in 1940. A large commercial planting of tulips consisting of several thousand plants near Fergus, Ont., was inspected; hardly a blossom could be found that was not spotted and disfigured by the disease (J. E. Howitt). Fire was reported at Kentville, N.S. The disease was most severe on Darwin tulips and other late varieties at Charlottetown, P.E.I., but some was present on the early tulips. (R. R. Hurst)

Storage Rot (Penicillium sp.) caused a trace to severe damage on the Lower Mainland and Vancouver Island, B.C.

Break (virus). Usually less than 1% of the plants were affected in plantings in B.C. (R. J. Hastings)

VERONICA

Leaf Spot (Septoria Veronicae) was severe on some plants at Morden, Man.

ZINNIA

Wilt (Sclerotinia sclerotiorum) caused moderate damage in the University gardens, Winnipeg, Man.; a first record on this host in Manitoba (W. L. Gordon). About 5% of the plants were destroyed after the plants had begun to bloom at the Station, Ste. Anne de la Pocatiere, Que.

VIII. Additions to the Fungus Flora of the Mackenzie River Basin

Margaret Newton

During a holiday trip down the Mackenzie River to Aklavik, N.W.T., and return between August 27 and September 12, the author collected the parasitic fungi that were to be found on cereals, grasses, and other vegetation within comparatively easy reach of the points of call along the route.

A special effort was made to find the northernmost limit of the cereal rusts. Puccinia graminis was found on Hordeum jubatum at Hay River, N.W.T., situated at the western end of Great Slave Lake (latitude 61°). Heretofore, Churchill, Man., (latitude 58°) was the most northerly point at which stem rust has been collected in Canada. Puccinia triticina was found on wheat at Fort Smith. For position of these places see map, p. 102.

The most northerly point at which plots of wheat, oats, and barley were seen was Fort Simpson. For three hours, these plots were examined for traces of rust but none were found.

The collections from the Mackenzie River Basin are arranged alphabetically according to the pathogen:-

Erysiphe graminis DC. on Agropyron dasystachyum (Hook.) Scribn., Arctic Red River, N.W.T., August. 30; Oil Wells, N.W.T., Sept. 2; on Hordeum jubatum L., Ft. Good Hope, N.W.T., Sept. 1; Hay River, N.W.T., Sept. 10.

Fusarium 1/ sp., on Salix sp., Fort Simpson, N.W.T., Sept. 6.

Heterosporium Phlei 2/ Gregory, on Phleum pratense L., Fort Resolution, N.W.T., Sept. 10.

Melampsora Abieti-capraearum 3/ Tub. on Salix sp., Ft. Good Hope, N.W.T., Sept. 1; Oil Wells, N.W.T., Sept. 2; Fort Simpson, N.W.T., Sept. 6. on Salix sp., Oil Wells, N.W.T., Sept. 2.

Melampsora Bigelowii 1/ Thüm. on Salix spp., Ft. Good Hope, N.W.T., Sept. 1; Ft. McMurray, Alta., Aug. 27.

Phragmidium americanum 4/ (Pk.) Diet. on Rosa sp. Arctic Red River, N.W.T. Aug. 30; Fort Good Hope, N.W.T., Sept. 11.

Phragmidium disciflorum 4/ (Tode) James on Rosa sp. Fort McMurray, Alta., August 27.

Phragmidium speciosum 4/ (Fr.) Cooke on Rosa sp. Fort McMurray, Alta., August 27.

1/ Identified by W. L. Gordon,
2/ Identified by J. E. Machacek,
3/ Identified by I. L. Conners,
4/ Identified by A. M. Brown.

Phyllactinia corylea 1/ (Pers.) Karst. on Cornus stolonifera Michx., Fort Simpson, N.W.T., Sept. 6.

Phytomonas coronafaciens 5/ (Elliott) Bergey et al. (lacking halo) on Avena sativa L., Fort Simpson, N.W.T., Sept. 6.

Puccinia Asteris 4/ Duby on Aster sp. Fort Simpson, July 6.

Puccinia coronata 4/ Corda on Elaeagnus commutata Bernh., Fort Simpson, N.W.T., July 6.

Puccinia graminis Pers. on Hordeum jubatum L., Hay River, N.W.T., Sept. 10; Fort Chipewyan, Alta., Sept. 14; Ft. McMurray, Alta., Aug. 27; on Hordeum vulgare L., Ft. McMurray, Alta., Sept. 28. From this latter collection was isolated P. graminis Tritici race 56.

Puccinia pygmaea 6/ Erikss. on Arctagrostis latifolia (R.Br.) Griseb. Ft. Good Hope, N.W.T., Sept. 1.

Puccinia triticina Erikss. on Triticum aestivium L., Ft. Smith, N.W.T., Sept. 12. From this collection was isolated P. trit. races 1 and 58.

Pucciniastrum pustulatum 1/ (Pers.) Diet. on Epilobium sp., Arctic Red River, N.W.T., Aug. 30; Ft. Good Hope, N.W.T., Sept. 1; Oil Wells, N.W.T., Sept. 2. Ft. Norman, N.W.T., Sept. 3.

Rhytisma salicinum 1/ (Pers.) Fr. on Salix spp., Ft. Simpson, N.W.T., Sept. 6.

Septoria Bromi 2/ Sacc. on Bromus ciliatus L., Ft. Good Hope, N.W.T., Sept. 1.

Uncinula Salicis 1/ (DC.) Winter on Salix sp., Ft. Simpson, N.W.T., Sept. 6.

Ustilago Hordei 7/ (Pers.) K. & S. on Hordeum vulgare L., Ft. Smith, N.W.T., Sept. 12.

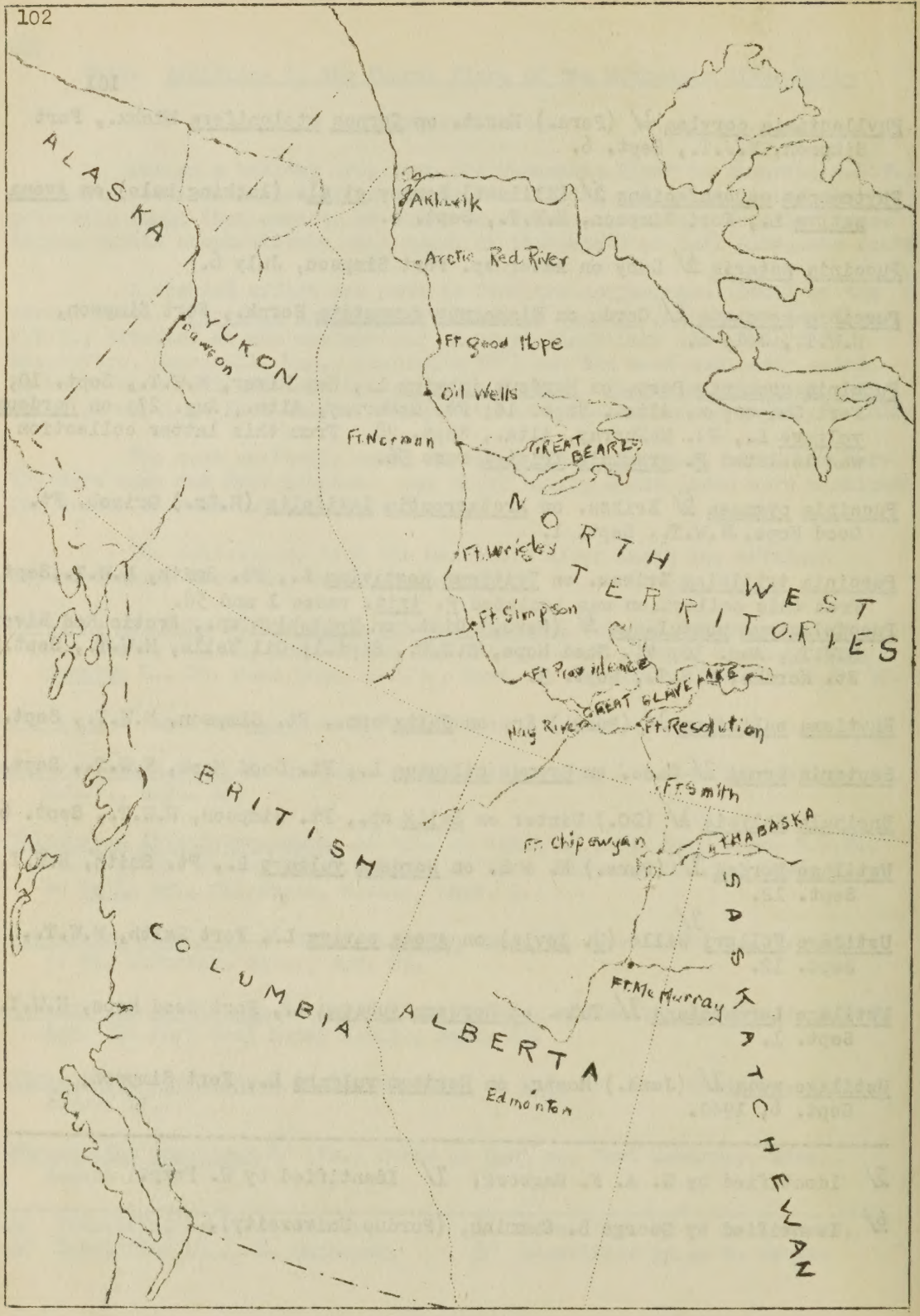
Ustilago Kolleri 7/ Wille (U. levis) on Avena sativa L., Fort Smith, N.W.T., Sept. 12.

Ustilago Lorentziana 7/ Thüm. on Hordeum jubatum L., Fort Good Hope, N.W.T., Sept. 1.

Ustilago nuda 7/ (Jens.) Rostr. on Hordeum vulgare L., Fort Simpson, Sept. 6, 1940.

5/ Identified by W. A. F. Hagborg, 7/ Identified by W. Popp.

6/ Identified by George B. Cummins, (Purdue University),


ALASKA
YUKON
Dawson
Aklavik
Arctic Red River
Ft Good Hope
Oil Wells
Ft Norman
GREAT BEAR L.
NORTH WEST TERRITORIES
Ft. Wrigley
Ft Simpson
Ft Providence
GREAT SLAVE LAKE
Hay River
Ft. Resolution
Ft Smith
Ft Chipewyan
ATHABASKA
BRITISH COLUMBIA
ALBERTA
Ft McMurray
Edmonton
SASKATCHEWAN

INDEX OF HOSTS

Abies balsamea..... 86
Acer..... 86
Aesculus..... 86
Alfalfa..... 18
Althaea rosea..... 89
Antirrhinum..... 89
Apple..... 67
Apricot..... 73
Aquilegia..... 89
Asparagus..... 29
Aster..... 89
Azalea..... 89

Barberry..... 89
Barley..... 14
Bean..... 29
Bean, Broad..... 31
Bean, Lima..... 37
Beet..... 30
Beet, Sugar..... 25
Berberis..... 89
Berry Boxes..... 88
Betula..... 86
Blueberry..... 73
Boysenberry..... 73
Broccoli..... 31
Buckwheat..... 22

Cabbage..... 31
Cabbage, Chinese..... 34
Callistephus..... 90
Caragana..... 90
Carrot..... 32
Cauliflower..... 33
Celery..... 33
Celosia..... 90
Centaurea..... 90
Cherry..... 74
Cherry, Sand..... 84
China Aster..... 90
Christmas Rose..... 93
Chrysanthemum..... 90
Clarkia..... 90
Clematis ligusticifolia..... 90
Clover, Common..... 20
Clover, Sweet..... 21
Cockscomb..... 90
Columbine..... 89
Coreopsis..... 91
Corn..... 23
Corn, Sweet..... 53
Cornus..... 86
Cosmos..... 91
Cotoneaster..... 91
Cranberry..... 76
Crataegus..... 91
Cucumber..... 34
Currant..... 76

Dahlia..... 91
Delphinium..... 91
Dianthus..... 91
Dimorphotheca..... 92

Eggplant..... 35
Evonymus alata..... 92

Flax..... 23
Fraxinus..... 86
Fresia..... 92

Garden Cress..... 35
Geranium..... 96
Gladiolus..... 92
Gloxinia..... 93
Godetia..... 93
Golden Glow..... 98
Goldenrod..... 98
Gooseberry..... 77
Grape..... 77
Grasses, Cultivated..... 26

Hawthorn..... 91
Helianthus..... 93
Heliopsis..... 93
Helleborus niger..... 93
Hollyhock..... 89
Honeysuckle..... 95
Hop..... 35

Insects..... 88
Iris..... 93

Jerusalem Artichoke..... 36
Juglans regia..... 86
Juniperus..... 86

Kale..... 36

Larkspur..... 91
Lathyrus odoratus..... 94
Lavatera..... 94
Lettuce..... 36
Ligustrum..... 94
Lilac..... 98
Lilium..... 94
Loganberry..... 78
Lonicera..... 95
Lupin..... 22
Lupinus perennis..... 95
Lycium halimifolium..... 95

Malope..... 95
Mangel..... 24
Marigold..... 98
Matthiola..... 95
Melon..... 95
Millet, Foxtail..... 24
Mushroom..... 37

Narcissus..... 95
Nemesia..... 95

Oats..... 10
Onion..... 37

Paeonia..... 96
Parsley..... 38
Parsnip..... 38
Pea..... 38
Peach..... 78
Pear..... 80
Pelargonium..... 96
Peony..... 96
Pentstemon..... 96
Pepper..... 39
Petunia..... 96
Phlox..... 96
Picea..... 86
Pinus..... 87
Plum..... 81
Populus..... 87
Potato..... 40
Potato viruses..... 63
Primula..... 96
Privet..... 94
Prune..... 82
Pumpkin..... 51

Radish..... 52
Raspberry..... 82
Rhamnus..... 97
Rhododendron..... 89, 97
Rhubarb..... 52
Ribes..... 97
Rosa..... 97
Rudbeckia..... 98
Rye..... 17

Salix..... 87
Salsify..... 52
Snapdragon..... 89
Solidago..... 98
Sorghum..... 25
Soy Bean..... 25
Spinach..... 52
Stocks..... 95
Strawberry..... 84
Sunflower..... 26
Sunflower, ornamental..... 93
Sweet Pea..... 94
Sweet Potato..... 53
Swiss Chard..... 53
Syringa..... 98

Tagetes..... 98
Thuja..... 87
Tobacco..... 53
Tomato..... 56
Tulipa..... 98
Turnip..... 61

Ulmus..... 88

Vegetable Marrow..... 62
Veronica..... 99

Wheat..... 1

Youngberry..... 85

Zinnia..... 99